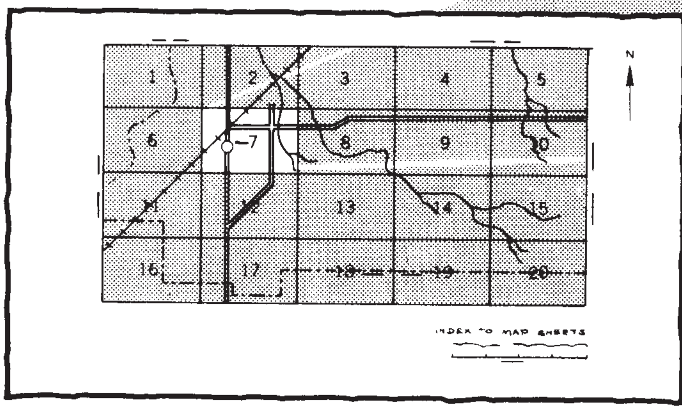
United States
Department of
Agriculture

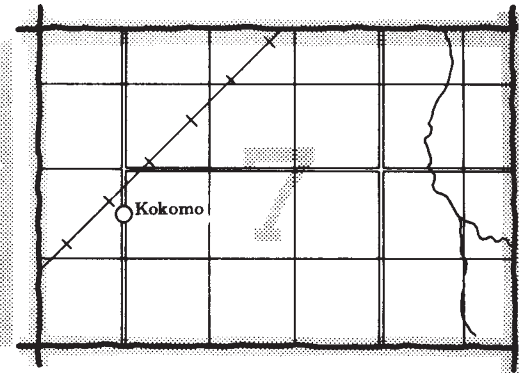
Soil
Conservation
Service

In cooperation with
Forest Service
the Louisiana
Agricultural
Experiment Station
and the Louisiana
State Soil and
Water Conservation
Committee

Soil Survey of Grant Parish, Louisiana

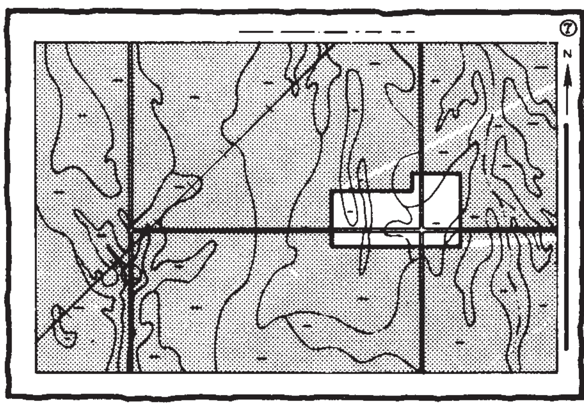
1. Locate your area of interest on the "Index to Map Sheets".

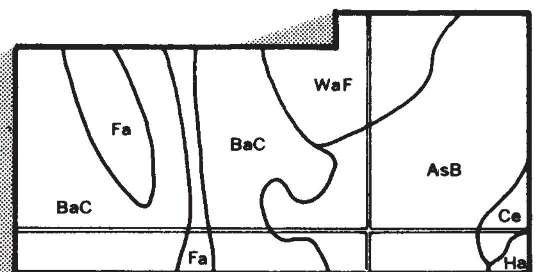




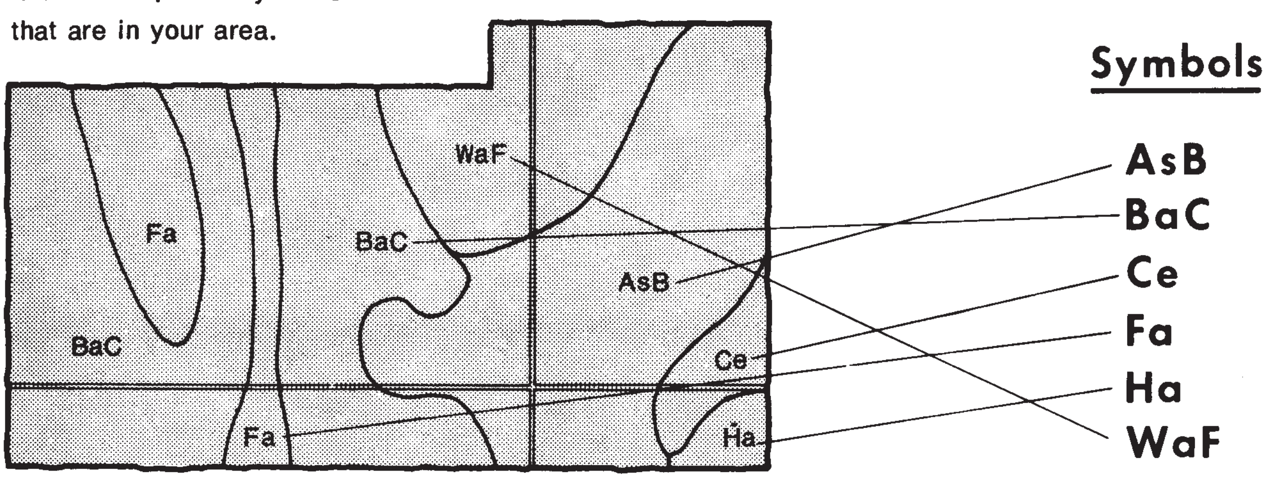
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

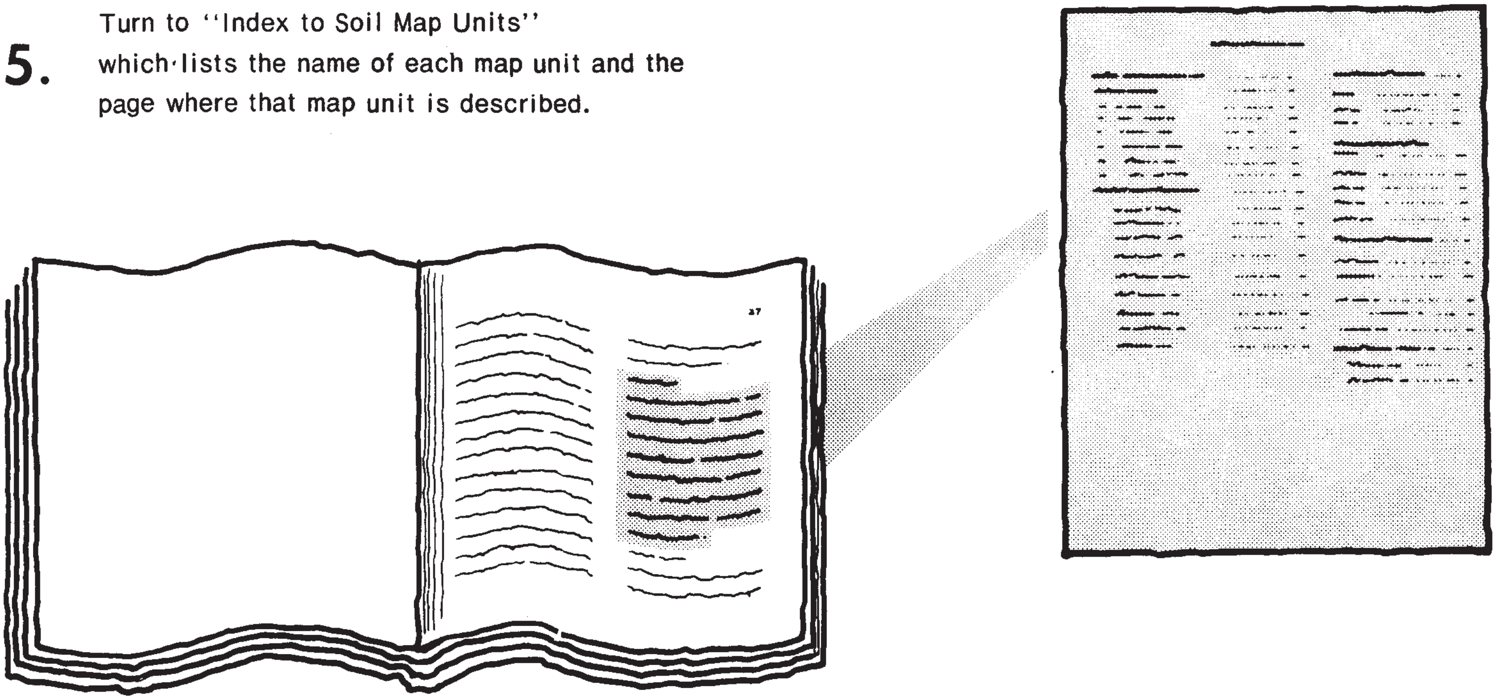




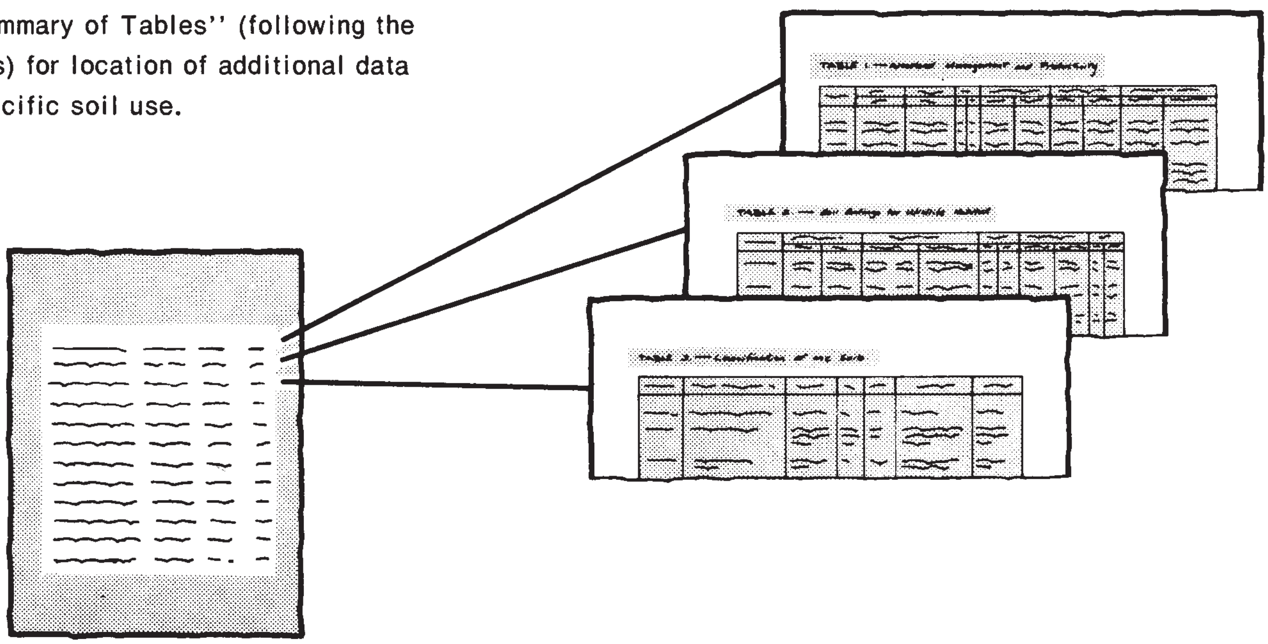
4. List the map unit symbols that are in your area.



5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1980. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, the Louisiana Agricultural Experiment Station, and the Louisiana Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Grant Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Soybeans growing on Roxana very fine sandy loam.

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Soil Series

Issued December 1986

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Grant Parish. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Harry A. Rucker

Harry S. Rucker
State Conservationist
Soil Conservation Service

Location of Grant Parish in Louisiana.

Soil Survey of
Grant Parish, Louisiana

By W. Wayne Kilpatrick and Charles Henry, Jr., Soil Conservation Service;
Jerry Ragus, Allen Ardoin, and Perry Mason, Forest Service; and
Emile Williams, Louisiana Soil and Water Conservation Committee

United States Department of Agriculture, Soil Conservation Service,
in cooperation with Forest Service,
the Louisiana Agricultural Experiment Station,
and Louisiana Soil and Water Conservation Committee

GRANT PARISH is in the central part of Louisiana, about 120 miles northwest of Baton Rouge and about 12 miles north of Alexandria. The total area, including 625 acres of small bodies of water, is 417,702 acres. The total area, including 7,232 acres of large bodies of water, is 424,934 acres. The population in 1980 was 16,702. Colfax, the parish seat, has a population of about 1,900. About 80 percent of the population is rural. The parish is mostly in woodland or is used for farming. About 82 percent of the land is woodland, and the rest is mainly cultivated cropland and pastureland. About 139,686 acres of the woodland is within the Kisatchie National Forest. There is no significant trend toward a change in land use.

The parish is made up of two general areas: the forested Terrace Uplands, which are used mainly for commercial woodland production, and the Flood Plains, which are used for both cropland and woodland. The elevation ranges from about 300 feet above sea level on the Terrace Uplands to as low as 40 feet above sea level on the flood plains of the Little River.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent parishes. Differences are the result of better information on soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey.

General Nature of the Survey Area

This section gives general information concerning the parish. It discusses farming, climate, history and development, transportation, and water resources.

Farming

Most of Grant Parish is forested. The economy depends mainly on the production of timber and the manufacture of timber products. Farming is another important source of income. The oil and gas industries also contribute to the economic growth of the parish.

In 1980 about 82 percent of the parish was woodland, and the rest was mainly cropland and pastureland. The principal crop is soybeans. Small grains, corn, and truck and garden crops are also important.

According to the 1979 annual report of the Louisiana Cooperative Extension Service, gross farm value for forestry products was about 7.4 million dollars; for soybeans, 5.9 million dollars; and for truck crops, 0.25 million dollars. Total livestock production grossed about 3.9 million dollars in 1978. Gross value of pecan production was about 50 thousand dollars.

The acreage of cotton and corn has significantly decreased during the past 15 years. These crops have been replaced mostly by soybeans.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Belah, Louisiana, in the period 1952 to 1977. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 49 degrees F, and the average daily minimum temperature is 38 degrees. The lowest temperature on record, which occurred at Belah on January 12, 1962, is 6 degrees. In summer the average temperature is 81 degrees, and the average daily maximum temperature is 92 degrees. The highest recorded temperature, which occurred on August 6, 1964, is 106 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 58 inches. Of this, 29 inches, or 50 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 22 inches. The heaviest 1-day rainfall during the period of record was 9.5 inches at Belah on April 29, 1953. Thunderstorms occur on about 70 days each year, and most occur in summer.

The average seasonal snowfall is 1 inch. The greatest snow depth at any one time during the period of record was 5 inches. On the average, there is seldom a day that has at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 60 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 6 miles per hour, in spring.

History and Development

Grant Parish was organized in 1869. At that time its total population was about 4,515. The parish was formed from parts of Winn Parish on the north and Rapides Parish on the south. The Red River was the western boundary, and the Little River was the eastern boundary. No change has been made in the boundaries.

The first white man in this area was Moscoso, the successor of DeSoto, who passed through the region trying to make his way to Mexico from the swamps of the Ouachita River. He was stopped by the fierce Chickasaw Indians and forced to return to the Mississippi River.

Grant Parish lies on high land above the swamps of southern Louisiana. This area became a route for early explorers and pioneers who looked for land to settle west from Natchez and south from Natchitoches.

Before the advent of white men, this region was inhabited by various tribes of American Indians. The early inhabitants were sedentary farmers who placed only secondary reliance on hunting and fishing. Arrowheads, tomahawks, pottery, and other relics are still found in abundance at sites in many parts of the parish.

From earliest times, farming has been the chief occupation of the people of Grant Parish. The first farmers settled on large plantations along the Red River. Sugarcane and cotton were grown.

The terrace uplands in this area were settled by small independent farmers. The open areas in the forests were excellent pasture, and raising livestock became an early enterprise.

Prospecting for oil began in the northeastern part of the parish in the early 1920's. Over a dozen wildcat tests were made in the area before commercial production became feasible. Because production began at a depth of about 1,500 feet, drilling was not expensive. Salt water content was a problem on the first wells, however, and many wells were abandoned soon after completion.

Another important resource of Grant Parish is the production of sand and gravel. This product is mined from open pits in the area between Colfax and Fishville.

Transportation

Roads in the parish are mostly hard surfaced federal, state, and parish highways. There are also a number of parish and Forest Service gravel roads. U.S. Highways 71, 165, and 167 extend from north to south through the parish.

The parish is served by three main railroads. Routes generally parallel the U.S. Highways in a north-south direction.

Water transportation, which is mostly nonexistent at present, will add a new dimension to local tranportation when the Red River Navigation Project is completed in the late 1980's.

Water Resources

Charles R. Akers, staff geologist, Soil Conservation Service, prepared this section.

Two sources of water are available in Grant Parish—surface water and ground water.

Surface water is well distributed throughout Grant Parish, but generally the quantity of available water is limited because of intermittent periods of extremely low flows or because of local contamination (*32, 33*).

Nantachie Lake is a manmade lake that is used mainly for recreation. It has a 77-square mile drainage area. This area had a maximum discharge of 9,470 cubic feet per second on April 13, 1974. The drainage area has no flow at times during most years (*34*).

Iatt Lake, also a manmade recreational lake, has a drainage area of 242 square miles. This reservoir is suitable for water supply (*31*).

The Red River also supplies water for part of Grant Parish. The river has a low flow of about 4,400 cubic feet per second. Bacterial pollution is a serious problem within the entire reach of the river. Salmonella was isolated from a water sample in the Shreveport area (*33*).

Ground water is obtained from wells in Grant Parish that range from 15 to 615 feet in depth (*30*). The principal aquifers are the sands of the Cockfield Formation of the Eocene series, the Catahoula Formation of the Miocene series, and the overlying Pleistocene and Holocene series (*30*).

The Cockfield Formation produces fresh water only in the extreme northern part of the parish. The waters from this formation are salty throughout the rest of the parish (*30, 32*). Production of fresh ground water from the Miocene series is limited mostly to the part of the parish south of Fish Creek. This fresh ground water is limited because of the approximate up-dip limits of the Miocene deposition (*32*). Upland Pleistocene deposits overlie most of the Catahoula Formation in Grant Parish. These deposits supply most of the ground water used in this area (*30*).

The flood plains of the major drainageways in Grant Parish are blanketed with silt, clay, and sand. The thickness of the lowland Pleistocene deposits together with recent alluvium ranges from a few feet to about 130 feet. Small domestic supplies of hard water may be obtained from the fine sands of the lowland Pleistocene deposits; however, larger supplies of water can be obtained from the coarse sand (*30*).

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another resulting in gradual changes in characteristics. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from

farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed, and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation to precisely define and locate the soil is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, pasture, woodland, and urban uses. Cultivated crops are those grown extensively in the survey area. Pasture refers to native and improved grasses for livestock. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.*

The boundaries of the general soil map units in Grant Parish were matched, where possible, with those of the previously published survey of Rapides Parish, Louisiana. In a few places, however, the lines do not join, and the names of the map units differ. These differences resulted mainly because of changes in soil series concepts, differences in map unit design, and changes in soil patterns near the survey area boundaries.

Descriptions of the general soil map units follow.

Areas on Terrace Uplands Dominated by Level to Gently Sloping Soils That Have a Loamy Surface Layer and Subsoil

The two map units in this group consist of moderately well drained and poorly drained, loamy soils.

These map units make up about 23 percent of the parish. Most of the area is in woodland. Areas in pasture and cropland are small and scattered. Wetness is the main limitation of the soils for most uses.

1. Malbis-Glenmora

Gently sloping and very gently sloping, moderately well drained soils

This map unit consists of soils on broad ridgetops and gentle side slopes. Slopes range from 1 to 5 percent.

This unit makes up about 12 percent of the parish. It is about 67 percent Malbis soils, 30 percent Glenmora soils, and 3 percent soils of minor extent.

The gently sloping Malbis soils are on broad ridgetops and side slopes. The very gently sloping Glenmora soils are on broad ridgetops. Malbis soils have a surface layer of fine sandy loam and a subsoil of clay loam and sandy clay loam. Glenmora soils have a surface layer of silt loam and a subsoil of silt loam and silty clay loam. Both of these soils have a seasonal high water table from December through March or April.

Of minor extent in this map unit are the moderately well drained Cadeville soils on steeper and lower side slopes; the well drained Ruston soils on high, convex ridgetops; and the well drained Smithdale soils on upper parts of the steeper side slopes.

This map unit is used mainly for woodland. A few areas ranging from small to large are used for pasture. A few small areas are used for cultivated crops.

This map unit is well suited to woodland and has high potential for pine trees. Malbis soils have few limitations for this use. Glenmora soils are moderately limited in use of equipment because of wetness.

The soils in this map unit are well suited to pasture and cultivated crops. Low fertility and a moderate hazard of erosion are the main concerns. Additions of lime and fertilizer improve fertility, and the use of conservation tillage helps to control erosion.

This map unit is moderately well suited to most urban uses. Wetness and moderately slow and slow permeability are the main limitations.

2. Caddo-Glenmora-Guyton

Level, poorly drained soils and very gently sloping, moderately well drained soils

This map unit consists of soils on broad flats, in depressional areas, and in drainageways and soils on broad ridgetops and side slopes. Slopes range from 0 to 3 percent.

This unit makes up about 11 percent of the parish. It is about 44 percent Caddo soils, 31 percent Glenmora soils, 20 percent Guyton soils, and 5 percent soils of minor extent.

The poorly drained Caddo soils are on broad flats. They have a surface layer of grayish brown silt loam and a subsoil of light brownish gray and gray silty clay loam. The moderately well drained, very gently sloping Glenmora soils are mainly on broad ridgetops. They have a surface layer of dark grayish brown silt loam and a subsoil of yellowish brown and gray silt loam and silty clay loam. The poorly drained Guyton soils are on broad flats and in depressional areas and drainageways. They have a surface layer of grayish brown silt loam and a subsoil of grayish brown silty clay loam and light brownish gray silt loam.

Of minor extent in this Caddo-Glenmora-Guyton map unit are the moderately well drained Cadeville soils on side slopes.

Most of the acreage of this map unit is in woodland. A small acreage is used for pasture.

This map unit is well suited to woodland. It has high potential for pine trees. Guyton soils also have high potential for hardwood trees. Limited use of equipment and seedling mortality are the main concerns. Flooding is a hazard in this map unit in some areas of the Guyton soils.

The soils in this map unit are moderately well suited to cultivated crops. Low fertility and wetness are the main limitations. The hazard of erosion is a concern in areas of Glenmora soils. Areas of Guyton soils that are in drainageways are frequently flooded, and they are poorly suited to cultivated crops. A surface drainage system is generally needed in all of the soils in this Caddo-Glenmora-Guyton unit.

This map unit is well suited to pasture. Wetness, however, can limit the period of grazing on this soil in some years.

This map unit is poorly suited to most urban uses. Wetness and slow permeability are the main limitations. Guyton soils in drainageways are not suited to urban uses because of the hazard of frequent flooding on these soils.

Areas on Terrace Uplands Dominated by Very Gently Sloping to Hilly Soils That Have a Loamy Surface Layer and a Loamy or Clayey Subsoil

The five map units in this group consist of well drained to somewhat poorly drained soils that have a loamy surface layer and a loamy or clayey subsoil.

These map units make up about 55 percent of the parish. Most of the acreage is in woodland. Areas used for pasture and cropland are small and scattered. Slope and low fertility are the main limitations for most agricultural uses. Moderate to very slow permeability, slope, and moderate to high shrink-swell potential are the main limitations for urban uses.

3. Gore-Kolin

Very gently sloping to strongly sloping, moderately well drained soils that have a loamy surface layer and a loamy and clayey subsoil

This map unit consists of soils on ridgetops and side slopes in the terrace uplands. Slopes range from 1 to 12 percent.

This unit makes up about 8 percent of the parish. It is about 65 percent Gore soils, 18 percent Kolin soils, and 17 percent soils of minor extent.

The gently sloping to strongly sloping Gore soils are mainly on side slopes along drainageawys. They have a surface layer of silt loam and a subsoil of silty clay loam, silty clay, and clay. The underlying material is clay. The very gently sloping Kolin soils are mainly on broad ridgetops. They have a surface layer of silt loam and a subsoil that is silty clay loam in the upper part and silty clay in the lower part.

Of minor extent in this map unit are the poorly drained Guyton soils in depressional areas on broad ridgetops.

Most of the acreage of this map unit is in woodland. A small acreage is used for pastureland and cropland.

This map unit is moderately well suited to woodland. It has moderately high potential for pine trees. Wetness during winter and early in spring somewhat limits the use of equipment. Moderate seedling mortality is a concern.

The soils in this map unit are poorly suited to cultivated crops. Low fertility is the main limitation, and erosion is the main hazard. Additions of lime and fertilizer are needed for most crops, and special practices are required to control erosion.

The soils in this map unit are moderately well suited to pasture. Erosion is a hazard during pasture establishment, and low fertility is a limitation. Proper grazing practices, weed control, and additions of lime and fertilizer are needed for maximum quality of forage.

This map unit is poorly suited to most urban uses. Very slow permeability, slope, and high shrink-swell potential in the clayey subsoils are limitations. Wetness is an additional limitation in the Kolin soils. Drainage is

needed if roads and building foundations are constructed. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with soils that have low shrink-swell potential.

4. Cadeville-Metcalf

Gently sloping to strongly sloping, moderately well drained soils and nearly level, somewhat poorly drained soils that have a loamy surface layer and a loamy or clayey subsoil

This map unit consists of soils on ridgetops and side slopes in the terrace uplands. It is in the north-central part of the parish. The landscape consists of nearly level interstream divides and strongly sloping side slopes along drainageways. Slopes range from 0 to 12 percent.

This unit makes up about 8 percent of the parish. It is about 72 percent Cadeville soils, 24 percent Metcalf soils, and 4 percent soils of minor extent.

The moderately well drained, gently sloping to strongly sloping Cadeville soils are on side slopes along drainageways. The somewhat poorly drained, nearly level Metcalf soils are on ridgetops and broad interstream divides. Both soils have a surface layer of very fine sandy loam. The Cadeville soil has a subsoil and underlying material that are clay throughout. The Metcalf soil has a subsoil that is loam and silt loam in the upper part and clay loam in the lower part. The underlying material is clay. The Metcalf soil has a seasonal high water table from December through April.

Of minor extent in this map unit are the poorly drained Mayhew soils on broad, flat interstream divides.

Most of the acreage of this map unit is in woodland. A small acreage is used for pasture.

This map unit is moderately well suited to woodland. The Cadeville soils in this unit have moderately high potential for pine trees, and the Metcalf soils have high potential. Limited use of equipment because of the clayey subsoils and wetness are the main concerns in producing and harvesting timber. Moderate seedling mortality and the hazard of erosion are additional concerns.

This map unit is poorly suited to cultivated crops. Erosion is a hazard in the Cadeville soils, and wetness is a limitation in the Metcalf soils. Low fertility is a limitation in both soils.

The soils in this map unit are moderately well suited to pasture. Low fertility is the main limitation. Erosion is the main hazard in the Cadeville soils during pasture establishment. Wetness is a minor concern in areas of the Metcalf soil.

This map unit is poorly suited to urban uses. Very slow permeability and high shrink-swell potential are the main limitations. Erosion is an additional hazard in the Cadeville soils, and wetness is a problem in the Metcalf soils.

5. Smithdale-Ruston

Gently sloping to strongly sloping, well drained soils that have a loamy surface layer and a loamy subsoil

This map unit consists of moderately sloping and strongly sloping soils on side slopes and gently sloping soils on narrow ridgetops. The landscape is dissected by many small drainageways. Slopes range from 1 to 12 percent.

This unit makes up about 31 percent of the parish. It is about 49 percent Smithdale soils, 45 percent Ruston soils, and 6 percent soils of minor extent.

The moderately sloping and strongly sloping Smithdale soils are on side slopes. They have a surface layer of fine sandy loam and a subsoil of sandy clay loam and fine sandy loam or sandy loam. The gently sloping Ruston soils are on ridgetops. They have a surface layer of fine sandy loam and a subsoil of sandy clay loam and fine sandy loam.

Of minor extent in this map unit are the moderately well drained Malbis and Cadeville soils. Malbis soils are on broader ridgetops, and Cadeville soils are on some of the lower side slopes.

Soils in this map unit are used mainly for woodland. A small acreage is used for pasture.

This map unit is well suited to woodland. It has high potential for pine trees. The soils have few limitations for woodland use and management. Some areas, however, are within an abandoned military bombing range site. In these areas use of equipment is limited because of the possibility of unexploded bombs.

This map unit is poorly suited to cultivated crops. Low fertility and a severe hazard of erosion on the steeper slopes are the main limitations. Ruston soils on less sloping ridgetops, however, are not so subject to erosion. Areas of this unit within the military bombing range site are not suitable for crops.

The soils in this map unit are well suited to pasture. Low fertility and a hazard of erosion during establishment of pasture plants are the main concerns. Areas within the military bombing range site are best suited to native grass pasture.

This map unit is moderately well suited to urban uses. Steepness of slopes is the main limitation. If this limitation is taken into consideration, most areas can provide good building sites. Areas within the military bombing range site are not suitable for urban uses.

6. Cadeville-Ruston

Gently sloping to strongly sloping, moderately well drained and well drained soils that have a loamy surface layer and a clayey or loamy subsoil

This map unit consists of moderately sloping and strongly sloping soils on side slopes and gently sloping soils on narrow ridgetops. The landscape is dissected by

many small drainageways. Slopes range from 1 to 12 percent.

This unit makes up about 7 percent of the parish. It is about 73 percent Cadeville soils, 21 percent Ruston soils, and 6 percent soils of minor extent.

The moderately well drained, gently sloping to strongly sloping Cadeville soils are on ridgetops and side slopes. They have a surface layer of very fine sandy loam and a subsoil of clay, silty clay, and silty clay loam. The underlying material is silty clay, silty clay loam, and very fine sandy loam. The well drained, gently sloping Ruston soils are on ridgetops. They have a surface layer of fine sandy loam and a subsoil of sandy clay loam and fine sandy loam.

Of minor extent in this map unit are the well drained Smithdale soils on upper side slopes and the moderately well drained Malbis soils on some of the broader ridgetops.

Most of the acreage of this map unit is in woodland. A small acreage is used for pasture.

This map unit is moderately well suited to woodland. Cadeville soils have moderately high potential for pine trees, and Ruston soils have high potential. The use of equipment is severely limited on the Cadeville soils because of the clayey subsoil. Ruston soils have few limitations for use and management. Some areas, however, are within an abandoned military bombing range site. In these areas the use of equipment is severely limited because of the possibility of unexploded bombs.

This map unit is poorly suited to cultivated crops. Low fertility is a limitation, and erosion is a severe hazard on the steeper slopes. Areas of this map unit within the military bombing range site are not suitable for crops.

The soils in this map unit are moderately well suited to pasture. Low fertility, the hazard of erosion, and limited use of equipment are the main concerns. Areas within the military bombing range site are better suited to native grass pasture than to other uses.

This map unit is poorly suited to urban uses. Steepness of slopes, moderate and high shrink-swell potential, and moderate and very slow permeability are the main limitations.

7. Rigolette-Kisatchie

Hilly, somewhat poorly drained and well drained soils that have a loamy or sandy surface layer and a loamy or clayey subsoil

This map unit consists of soils on narrow ridgetops and soils on short, moderately sloping to steep, irregular side slopes that are dissected by numerous drainageways.

This unit makes up about 1 percent of the parish. It is about 38 percent Rigolette soils, 32 percent Kisatchie soils, and 30 percent soils of minor extent.

The somewhat poorly drained Rigolette soils are on plane and concave side slopes and on benches at midslope. They have a surface layer of loamy fine sand and a subsoil that is fine sandy loam and sandy clay loam in the upper part and silty clay in the lower part. The underlying material is silty clay. Kisatchie soils are on convex side slopes. They have a surface layer of very fine sandy loam and a subsoil of clay loam and silty clay. The underlying material is sandstone.

Of minor extent in this map unit are the well drained Briley, Ruston, and Smithdale soils on narrow ridgetops and upper side slopes and the moderately well drained Cadeville soils on plane and convex side slopes. Outcrops of sandstone and siltstone are on the surface in places.

All of the acreage of this map unit is in woodland, mainly pine trees.

This map unit is poorly suited to woodland, and it has poor potential for pine trees. Moderate seedling mortality and a moderate hazard of erosion are the main concerns in producing and harvesting trees. The use of equipment is severely limited on the steeper areas because of sandstone or siltstone outcrops, and wetness is an additional limitation to the use of equipment on the Rigolette soil. In addition, trees are subject to windthrow because of limited rooting depth. Some of these soils are within an abandoned military bombing range site and the use of equipment is severely restricted because of the possibility of unexploded bombs.

This map unit is poorly suited to cultivated crops. Slopes are generally too steep, and the hazard of erosion is too severe for cultivation. Areas of this map unit within the military bombing range site are not suitable for use as cropland.

The soils in this map unit are poorly suited to use as pasture. Steep slopes and rock outcrops are severe limitations. Areas within the military bombing range site are best suited to native grasses.

This map unit is poorly suited to most urban uses. Slopes, rock outcrop, high shrink-swell potential, and very slow permeability are the main limitations. Areas within the military bombing range site are not suitable for urban uses.

Areas on Flood Plains and Natural Levees Dominated by Level and Gently Undulating, Loamy and Clayey Soils

The four map units in this group consist of well drained, somewhat poorly drained, and poorly drained, loamy and clayey soils on flood plains of rivers and streams.

These areas make up 22 percent of the parish. Most areas are cleared and are used for cropland and pasture. Frequently flooded map units are mainly in woodland. Wetness from the seasonal high water table and flooding are the main limitations to most agricultural and urban uses.

8. Guyton-Cascilla

Level, poorly drained and well drained soils that are loamy throughout

This map unit consists of soils on narrow flood plains of small streams that drain the terrace uplands. The soils are subject to frequent flooding, especially during the winter months.

This unit makes up about 9 percent of the parish. It is about 55 percent Guyton soils, 35 percent Cascilla soils, and 10 percent soils of minor extent.

The poorly drained Guyton soils have a surface layer of silt loam and a subsoil of silt loam and silty clay loam. The well drained Cascilla soils have a surface layer and subsoil of silt loam. The underlying material is fine sandy loam.

Of minor extent in this map unit are the well drained Cahaba soils on adjacent, low stream terraces.

The soils making up this map unit are used mainly for woodland. A few small areas are used for pasture.

This map unit is moderately well suited to woodland. The Guyton soil has high potential for pine and hardwood trees, and the Cascilla soil has very high potential. However, flooding and wetness can severely limit the use of equipment during winter months. Seedling mortality is moderate.

This map unit is poorly suited to cultivated crops. The area generally is flooded too frequently for this use.

The soils in this unit are moderately well suited to pasture. Wetness from flooding and low fertility are the main limitations.

This map unit is not suited to urban uses. The hazard of flooding is generally too severe for this use.

9. Moreland-Armistead-Latanier

Level and gently undulating, somewhat poorly drained soils that have a clayey or loamy surface layer and a clayey or loamy subsoil

This map unit consists of soils on the flood plains of the Red River. In most areas the landscape is long smooth slopes of less than 1 percent. In other areas it is low parallel ridges and swales that have slopes of 0 to 3 percent.

This unit makes up about 6 percent of the parish. It is about 68 percent Moreland soils, 12 percent Armistead soils, 11 percent Latanier soils, and about 9 percent soils of minor extent.

Moreland soils have a surface layer of clay, silty clay loam, or silt loam and a subsoil of clay and silty clay. They have a seasonal high water table from December to April. Most areas of Moreland soils are subject to rare flooding, but some areas are flooded occasionally. Armistead soils have a surface layer of clay and silty clay and a subsoil of silty clay loam and silt loam. The underlying material is silt loam. Armistead soils have a seasonal high water table from December to April. Latanier soils have a surface layer of clay and a subsoil of silty clay. The underlying material is silt loam and very fine sandy loam. Latanier soils have a seasonal high water table from December to April.

Of minor extent in this map unit are the well drained Gallion and Roxana soils on high positions on natural levees of the Red River and its distributaries.

Most of the acreage of this map unit is used for soybeans. A few small areas are used for woodland and pastureland.

This map unit is moderately well suited to cultivated crops. Wetness and poor tilth are the main limitations. Flooding is a hazard in places. A surface drainage system is needed for most crops. Conservation tillage and return of crop residue to the soil help to improve soil tilth.

The soils in this map unit are well suited to pasture. Wetness is the main limitation. Flooding is a hazard in places. Restricted grazing during wet periods helps to keep the pasture in good condition.

This map unit is well suited to woodland. The soils have high potential for hardwood trees. However, use of equipment is severely limited because of wetness. Seedling mortality is moderate.

This map unit is poorly suited to urban uses. Moderate to very high shrink-swell potential, slow and very slow permeability, wetness, and flooding are the main limitations.

10. Roxana-Gallion-Norwood

Level and gently undulating, well drained soils that are loamy throughout

This map unit consists of soils on natural levees of the Red River and its distributaries. Most areas are protected from flooding by manmade levees. In most areas the landscape is long, smooth slopes of 0 to 1 percent. Other areas are low, parallel ridges and swales that have slopes of 0 to 3 percent.

This unit makes up about 5 percent of the parish. It is about 39 percent Roxana soils, 37 percent Gallion soils, 22 percent Norwood soils, and 2 percent soils of minor extent.

Roxana soils have a surface layer of very fine sandy loam and underlying material of very fine sandy loam, loamy very fine sand, and silt loam. Gallion soils have a surface layer of silt loam or silty clay loam and a subsoil of silty clay loam, silt loam, and very fine sandy loam. The underlying material is silt loam and very fine sandy loam. Norwood soils have a surface layer of silt loam or silty clay loam and a subsoil of silty clay loam and silt loam. The underlying material is silty clay loam, silt loam, and very fine sandy loam.

Of minor extent in this map unit are the somewhat poorly drained Armistead, Latanier, and Moreland soils on the lower parts of natural levees.

Most of the acreage of this map unit is used for soybeans, corn, cotton, and grain sorghum. A few small areas are used as pastureland and woodland.

Most areas of these soils are well suited to cultivated crops; however, some occasionally flooded soils are only moderately well suited to cultivation, and other frequently flooded soils are poorly suited. Fertility is high in these soils.

Most of the soils in this map unit are well suited to use as pasture, but a few frequently flooded soils are only moderately well suited. Fertility is generally sufficient for sustained production of high quality, nonirrigated pasture.

This map unit is well suited to woodland. Soils in this unit have very high and high potential for southern hardwoods. Most of the soils have few limitations, but in places where the soils are subject to flooding, the use of equipment can be limited during flooding.

This map unit is moderately well suited to well suited to urban uses. Wetness and moderate permability are the main limitations. Some soils that are subject to flooding are poorly suited to urban uses.

11. Una-Urbo Variant

Level and very gently sloping, poorly drained and somewhat poorly drained soils that have a clayey or loamy surface layer and a clayey or loamy subsoil

This map unit consists of soils on the flood plains of the Little River. The soils are subject to occasional and frequent flooding. The landscape is long, smooth slopes of 0 to 1 percent except for areas that are broken by small mounds and ridges that have slopes of 1 to 3 percent.

This unit makes up about 2 percent of the parish. It is about 84 percent Una soils, 15 percent Urbo Variant soils, and 1 percent soils of minor extent.

The poorly drained Una soils have long, smooth slopes of less than 1 percent and are subject to frequent flooding. They have a surface layer and subsoil of silty clay. Una soils have a seasonal high water table from November to April. The very gently sloping Urbo Variant soils are on mounds and ridges and are subject to occasional flooding. They have a surface layer of silty clay loam and a subsoil of silty clay loam and sandy clay loam. The underlying material is fine sandy loam. Urbo Variant soils have a seasonal high water table from December to April.

Of minor extent in this map unit are the well drained Cahaba soils on adjacent, low stream terraces and the poorly drained Guyton soils on alluvial fans of streams that empty onto the flood plain of the Little River.

Almost all of the acreage of this map unit is in woodland. The soils are moderately well suited to this use. Una soils have high potential for hardwood trees, and Urbo Variant soils have moderately high potential. Seedling mortality, limited use of equiment because of wetness from flooding, and a seasonal high water table are the main concerns in producing and harvesting timber.

The soils in this map unit are poorly suited to use as cropland. The hazard of flooding is generally too severe for this use.

This unit is poorly suited to pasture. The limited period of grazing, a limited choice of pasture plants because of wetness from flooding, and a seasonal high water table are the main limitations.

This map unit is not suited to urban uses because the hazard of flooding is severe.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Moreland clay is one of several phases in the Moreland series.

Some map units are made up of two or more major soils. These map units are called soil associations or undifferentiated groups.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Rigolette-Kisatchie association, hilly, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Guyton and Cascilla soils, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

The boundaries of map units in Grant Parish were matched, wherever possible, with those of the published survey of Rapides Parish. In a few places the lines do not join, and there are some differences in the names of the map units. These differences result mainly from changes in soil series concepts, differences in map unit design, and changes in soil patterns near survey area boundaries.

On the detailed soil maps all of the soil areas in Grant Parish are mapped at the same level of detail, except for some areas that are frequently flooded and some hilly and steeply sloping areas. In these areas steep slopes, rock outcrops, or frequent flooding so limit the use and management of the soil areas that separating each kind of soil in these areas would be of little value to the land user. In addition, all of the areas of Ruston-Cadeville association, moderately rolling, and Ruston-Smithdale association, moderately rolling, are within the boundaries of an abandoned military bombing range site. In these areas, the possibility of unexploded bombs severely limits the use of the soil areas.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Descriptions of the detailed soil map units follow.

Ad—Armistead clay. This level, somewhat poorly drained soil is on natural levees of former channels and distributaries of the Red River. Areas of this soil range

from about 30 to 400 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is about 14 inches thick. It is dark brown, slightly acid clay in the upper part and dark reddish brown, neutral silty clay in the lower part. The next layer is dark brown, neutral silt loam. The subsoil is reddish brown, mildly alkaline silty clay loam in the upper part and yellowish red, mildly alkaline silt loam in the lower part. The underlying material to a depth of about 75 inches is yellowish red, moderately alkaline silt loam.

Included with this soil in mapping are a few small areas of Latanier and Moreland soils. These areas make up about 10 percent of the map unit. The Latanier soils are on slightly higher positions than Armistead soil and do not have strongly expressed subsoil horizons. The Moreland soils are on lower positions and have a more clayey subsoil.

This Armistead soil has high fertility. Water moves through the upper part of the soil at a slow rate and through the lower part at a moderately slow rate. Water runs off the surface at a slow rate and stands in low places for short periods after heavy rains. The surface layer of this soil is very sticky when wet and dries slowly. A seasonal high water table fluctuates between a depth of about 1.5 and 3 feet from the surface from December through April. The surface layer of this soil has high shrink-swell potential, and the subsoil has low shrink-swell potential. Adequate water is available to plants in most years.

Most of the acreage of this soil is used for cropland. A small acreage is in pasture.

This soil is well suited to cultivated crops. The main crops are cotton, wheat, oats, and grain sorghum. Wetness, slow intake of water, and poor tilth are the main limitations. Proper arrangement of rows, surface field ditches, and vegetated outlets are needed to remove excess surface water. Land grading and smoothing improves the surface drainage and permits efficient use of farm equipment. The use of minimum tillage and returning all crop residue to the soil or adding other organic matter improves fertility and helps to maintain tilth and content of organic matter.

This soil is well suited to pasture. Wetness and slow intake of water are the main limitations. Grazing when the soil is wet results in compaction of the surface layer and damage to the plant community. The main suitable pasture plants are common bermudagrass, improved bermudagrass, ryegrass, bahiagrass, dallisgrass, tall fescue, white clover, and southern winterpeas. Excessive water on the surface can be removed by a properly designed drainage system. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to woodland. The potential for hardwoods is high. Only a few areas, however, remain in native woodland. Restricted use of equipment and seedling mortality caused by wetness are the main concerns in producing and harvesting timber. Reforestation after harvesting needs to be carefully managed to reduce competition from undesirable understory plants. Conventional methods of harvesting timber generally are suitable, but the soil may become compacted if it is wet and heavy equipment is used.

This soil is moderately well suited to urban uses. Wetness is the main limitation for building site development and for most sanitary facilities. Drainage is needed if roads and building foundations are constructed. Septic tank absorption fields do not function properly during rainy periods because of wetness and moderately slow permeability.

This soil is poorly suited to most recreational uses. It is limited mainly by the clay surface layer. Areas used for playgrounds can be improved by providing good surface drainage and by coating the area with several inches of loamy fill material.

This Armistead soil is in capability subclass IIw and woodland group 2w.

Br—Briley loamy fine sand, 5 to 12 percent slopes. This sloping, well drained soil is on narrow ridgetops and side slopes in the terrace uplands. This soil is sandy to moderate depths and loamy below. Areas range from about 10 acres to 80 acres.

The surface layer is dark grayish brown, medium acid loamy fine sand about 7 inches thick. The subsurface layer is light yellowish brown loamy fine sand. It is medium acid in the upper part and strongly acid in the lower part. The subsoil to a depth of about 65 inches is yellowish red, very strongly acid sandy clay loam in the upper part and yellowish red, very strongly acid fine sandy loam in the lower part.

Included with this soil in mapping are a few small areas of Ruston and Smithdale soils. Also included are a few large areas of soils that are sandy to a depth of 60 inches or more but otherwise are similar to Briley soil. The included soils make up about 15 percent of the map unit. Ruston soils do not have thick sandy surface and subsurface layers but are in positions similar to those of Briley soils. Smithdale soils are on lower side slopes and are loamy throughout.

This Briley soil has low fertility. Water and air move through the upper part of the soil at a rapid rate and through the lower part at a moderate rate. Water runs off the surface at a slow rate. Plants generally suffer from lack of water during dry periods in summer and in the fall of most years. This soil dries quickly after rains. The shrink-swell potential is low.

Most of the acreage of this soil is in woodland. A small acreage is in pasture.

This soil is poorly suited to cultivated crops. Droughtiness and the hazard of erosion are the main limitations. Crop residue left on the surface helps to

conserve moisture and control erosion. Most crops respond well to additions of fertilizer and lime.

This soil is moderately well suited to pasture. Droughtiness, slope, low fertility, and the hazard of erosion are the main limitations. Pasture plants are difficult to establish because of droughtiness. Suitable pasture plants are improved bermudagrass, weeping lovegrass, bahiagrass, and crimson clover. Applications of fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is well suited to woodland. The potential for pine trees is moderately high. Traction is poor when the surface layer of this soil is dry, and seedling mortality is generally moderately high because of droughtiness. Conventional methods of harvesting trees can be used.

This soil is moderately well suited to urban uses. Steepness of slopes and the hazard of erosion are the main limitations. Cutbanks of shallow excavations cave easily. Preserving the existing plant cover during construction helps to control erosion. Plant cover can be established and maintained by properly fertilizing, seeding, mulching, and shaping of slopes.

This soil is moderately well suited to recreational development. Steepness of slope and the sandy surface layer are the main limitations. Cuts and fills should be seeded or mulched. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This Briley soil is in capability subclass IVe and woodland group 3s.

Ca—Caddo silt loam. This level, poorly drained soil is on broad flats in the terrace uplands. Areas range from about 30 acres to 500 acres. Slopes range from 0 to 1 percent.

Typically, the surface layer is grayish brown, very strongly acid silt loam about 4 inches thick. The subsurface layer is about 17 inches thick. It is grayish brown, strongly acid silt loam in the upper part and light brownish gray, strongly acid silt loam in the lower part. The subsoil to a depth of about 80 inches is light brownish gray, mottled, strongly acid silty clay loam in the upper and middle parts and gray, mottled, very strongly acid silty clay loam in the lower part.

Included with this soil in mapping are a few small areas of Glenmora and Guyton soils. These areas make up about 10 percent of the map unit. Glenmora soils are on more sloping positions than Caddo soil and are redder throughout. Guyton soils are on lower positions and do not have red mottles in the subsoil.

This Caddo soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to most crops. Water and air move through this soil at a slow rate. Water runs off the surface at a slow rate and stands in low places for short periods after heavy rains. A seasonal high water table fluctuates between a depth of 2 feet and the surface from December through April. This soil is slow to dry out in the spring; however, crops suffer from lack of water during dry periods in the summer and fall of most years. The shrink-swell potential is low.

Most of the acreage of this soil is in woodland. A small acreage is in pasture.

This soil is moderately well suited to cultivated crops. The main crops are corn and soybeans. Wetness is the main limitation. Potentially toxic levels of exchangeable aluminum within the rooting zone are also a limitation. A drainage system is needed for most cultivated crops and pasture plants. Land grading and smoothing improves the surface drainage and permits more efficient use of farm equipment. Surface crusting and soil compaction can be reduced by returning crop residue to the soil. Crops respond well to additions of lime and fertilizer, which help to overcome low fertility and reduce the high levels of exchangeable aluminum.

This soil is well suited to pasture. Wetness and low fertility are the main limitations. Suitable pasture plants are common bermudagrass, bahiagrass, ryegrass, tall fescue, white clover, and southern winterpeas. Grazing when the soil is wet results in compaction of the surface layer. The use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Applications of fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is well suited to woodland. The potential for pine trees is high; however, the use of equipment is limited, and seedling mortality is generally moderately high because of wetness. Reforestation after harvesting needs to be carefully managed to reduce competition from undesirable understory plants.

This soil is poorly suited to urban uses. Wetness is the main limitation. Excess water can be removed by using shallow surface ditches and by proper grading. Slow permeability and the high water table increase the possibility of failure of septic tank absorption fields.

This soil is poorly suited to recreational development. Wetness is the main limitation. Good surface drainage should be provided for intensively used areas, such as playgrounds.

This Caddo soil is in capability subclass IIIw and woodland group 2w.

Cd—Cadeville very fine sandy loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridgetops and upper side slopes in the terrace uplands. Areas range from about 20 acres to 350 acres.

Typically, the surface layer is dark grayish brown, extremely acid very fine sandy loam about 3 inches thick. The subsurface layer is brown, very strongly acid very fine sandy loam about 3 inches thick. The subsoil is yellowish red, mottled, extremely acid clay in the upper part; red, mottled, extremely acid clay in the middle part; and light brownish gray, mottled, extremely acid clay in

the lower part. The underlying material to a depth of about 65 inches is stratified, light brownish gray silty clay and yellowish brown very fine sandy loam. It is extremely acid.

Included with this soil in mapping are a few small areas of Mayhew and Metcalf soils. These areas make up about 15 percent of the map unit. The poorly drained Mayhew soils are on broad flats and are gray throughout. The somewhat poorly drained Metcalf soils are on broad ridgetops and have a subsoil that is loamy in the upper part.

This Cadeville soil has low fertility and moderately high levels of exchangeable aluminum that are potentially toxic to some crops. Water and air move through this soil at a very slow rate. Water runs off the surface at a medium rate. The subsoil swells and shrinks markedly upon wetting and drying. Adequate water is available to plants in most years.

Most of the acreage of this soil is in woodland. A small acreage is in pasture.

This soil is moderately well suited to woodland. The potential for pine trees is moderately high. Moderate seedling mortality and severely restricted use of equipment because of the clay subsoil are the main concerns in producing and harvesting timber. Because the clay subsoil is sticky when wet, most planting and harvesting equipment can be used only during dry periods. Reforestation after harvesting needs to be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is well suited to pasture. Low fertility is the main limitation. Erosion is a hazard during establishment of pasture plants. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Applications of fertilizer and lime are needed for optimum growth of grasses and legumes. Periodic mowing and clipping helps to maintain uniform growth, discourages selective grazing, and reduces clumpy growth.

This soil is poorly suited to cultivated crops. Low fertility, the hazard of erosion, and potentially toxic levels of exchangeable aluminum within the rooting zone are the main limitations. Suitable crops are small grains and corn. Irregular slopes hinder tillage operations. The use of minimum tillage and the construction of terraces, diversions, and grassed waterways help to control erosion. Most crops and pasture plants respond well to additions of fertilizer and lime, which help to overcome low fertility and reduce the moderately high levels of exchangeable aluminum.

This soil is poorly suited to urban uses. High shrink-swell potential and the very slow movement of water and air through the soil are the main limitations. Plants are difficult to establish in areas where the surface layer has been removed and the clay subsoil exposed. Mulching and fertilizing these cut areas help to establish plants. In areas where septic tank absorption fields are installed, the use of sandy backfill for the trench and long absorption lines helps to compensate for the very slow permeability. High shrink-swell potential is a limitation in most areas where the soil is used for building site development. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

This soil is poorly suited to recreational development. Very slow permeability is the main limitation. Erosion and sedimentation can be controlled and the beauty of the area enchanced by maintaining adequate plant cover.

This Cadeville soil is in capability subclass IVe and woodland group 3c.

Ce—Cadeville very fine sandy loam, 5 to 12 percent slopes. This moderately sloping to strongly sloping, moderately well drained soil is on side slopes in the terrace uplands. Areas range from about 40 acres to 600 acres.

Typically, the surface layer is brown, strongly acid very fine sandy loam about 4 inches thick. The subsurface layer is brown, strongly acid very fine sandy loam about 3 inches thick. The subsoil is yellowish red, mottled, strongly acid silty clay in the upper part; light brownish gray, mottled, very strongly acid silty clay in the middle part; and gray, mottled, very strongly acid silty clay loam in the lower part. The underlying material to a depth of about 65 inches is gray silty clay loam that has thin strata of yellowish brown very fine sandy loam. It is very strongly acid.

Included with this soil in mapping are a few small areas of Kisatchie, Rigolette, and Smithdale soils. These areas make up about 15 percent of the map unit. Kisatchie soils are in positions similar to those of Cadeville soil and are underlain by siltstone or sandstone. Rigolette soils are on concave side slopes and have a subsoil that is loamy in the upper part. Smithdale soils are on upper side slopes at a higher elevation than Cadeville soil and have a loamy subsoil.

This Cadeville soil has low fertility and moderately high levels of exchangeable aluminum that are potentially toxic to some crops. Water and air move through this soil at a very slow rate. Runoff is rapid, and the hazard of erosion is high. The soil swells and shrinks markedly upon wetting and drying. Plants are damaged by lack of water during dry periods in some years.

Most of the acreage of this soil is in woodland. A small acreage is in pasture.

This soil is moderately well suited to woodland. The potential for pine trees is moderately high. Moderate seedling mortality and restricted use of equipment are the main concerns in producing and harvesting timber. Conventional methods of harvesting trees can be used.

Roads and landings can be protected from erosion by contructing diversions and by seeding the cuts and fills. Reforestation after harvesting needs to be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Because the clayey subsoil is sticky when wet, most planting and harvesting equipment can be used only during dry periods.

This soil is moderately well suited to pasture. Low fertility, the hazard of erosion during plant establishment, and restricted use of equipment on the steeper slopes are the main limitations. Suitable pasture plants are bahiagrass, common bermudagrass, improved bermudagrass, and crimson clover. Applications of fertilizer and lime are needed for optimum growth of grasses and legumes. Periodic mowing and clipping helps to maintain uniform growth, discourages selective grazing, and reduces clumpy growth.

This soil is poorly suited to cultivated crops. Low fertility, the hazard of erosion, and restricted use of equipment on the steeper slopes are the main limitations. The hazard of erosion generally is too severe for the production of crops. This soil also has moderately high levels of exchangeable aluminum within the rooting zone that are potentially toxic to some crops.

This soil is poorly suited to urban uses. Slope, very slow permeability, and high shrink-swell potential are the main limitations. Plants are difficult to establish in areas that have had the surface layer removed, and the clay subsoil exposed. Mulching and fertilizing cut areas help to establish plants. Effluent from absorption fields can surface in downslope areas and create a hazard to health. If buildings are constructed on this soil, foundations and footings should be properly designed and runoff diverted away from the buildings to help prevent structural damage as a result of shrinking and swelling.

This soil is poorly suited to recreational development. Very slow permeability and steepness of slope are the main limitations. Paths and trails should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This Cadeville soil is in capability subclass VIe and woodland group 3c.

Ch—Cahaba fine sandy loam, 1 to 3 percent slopes. This very gently sloping, well drained soil is on low stream terraces. Areas range from about 20 acres to 200 acres.

Typically, the surface layer is dark brown, very strongly acid fine sandy loam about 4 inches thick. The next layer is brown fine sandy loam and yellowish red sandy clay loam. It is strongly acid. The subsoil is yellowish red, strongly acid sandy clay loam in the upper and middle parts and yellowish red, strongly acid sandy loam in the lower part. The underlying material to a depth of about 65 inches is strongly brown, strongly acid loamy sand.

Included with this soil in mapping are a few small areas of Cascilla and Guyton soils. Cascilla soils are on natural levees within narrow flood plains and have less sand and clay than Cahaba soils. Guyton soils are on flood plains and are grayer throughout.

This Cababa soil has low fertility and moderately high levels of exchangeable aluminum that are potentially toxic to some crops. Water and air move through the subsoil at a moderate rate. The shrink-swell potential is low. Plants are damaged by lack of water during dry periods in the summer and fall of some years.

Most of the acreage of this soil is used for woodland. A small acreage is used for cultivated crops and pasture.

This soil is well suited to cultivated crops. The main crops are soybeans, corn, and truck crops. Low fertility, a slight hazard of erosion, and potentially toxic levels of exchangeable aluminum within the rooting zone are the main limitations. Using minimum tillage, farming on the contour, and constructing terraces, diversions, and grassed waterways help to control erosion. The organic matter content can be maintained by returning all crop residue, plowing under cover crops, and using a suitable cropping system. Most crops and pasture plants respond well to additions of lime and fertilizer, which help to overcome low fertility and reduce the moderately high levels of exchangeable aluminum.

This soil is well suited to pasture. Low fertility is the main limitation. Erosion is a hazard during plant establishment. Suitable pasture plants are coastal bermudagrass, common bermudagrass, improved bermudagrass, bahiagrass, ryegrass, weeping lovegrass, and crimson clover. Proper grazing practices, weed control, and additions of fertilizer and lime are needed to produce maximum quality forage.

This soil is well suited to woodland. The potential for pine trees is high. This soil has few limitations for use and management.

This soil is well suited to urban uses. It has few limitations for building sites, local roads and streets, and septic tank absorption fields. Disturbed areas around construction sites should be revegetated to help control erosion.

This soil is well suited to recreational development. It has few limitations for this use.

This Cahaba soil is in capability subclass IIe and woodland group 2o.

Ga—Gallion silt loam. This level, well drained soil is on natural levees of the Red River and its distributaries. It is protected from flooding by earthern levees. Areas range from about 30 acres to 700 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is brown, slightly acid silt loam about 8 inches thick. The upper and middle parts

of the subsoil are yellowish red, slightly acid silty clay loam. The lower part is yellowish red, slightly acid very fine sandy loam. The underlying material to a depth of about 65 inches is yellowish red, neutral very fine sandy loam.

Included with this soil in mapping are a few small areas of Armistead, Latanier, and Moreland soils. These areas make up less than 10 percent of the map unit. All of the included soils are on lower positions than Gallion soil. Armistead soils have a more clayey surface layer, and Latanier and Moreland soils have a more clayey subsoil.

This Gallion soil has medium fertility. Water and air move through the soil at a moderate rate. Water runs off the surface at a slow rate. Adequate water is available to plants in most years. This soil has moderate shrink-swell potential.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture.

This soil is well suited to cultivated crops. The main crops are soybeans, corn, cotton, and grain sorghum. The soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture content. The organic matter content can be maintained by returning all crop residue, plowing under cover crops, and using a suitable cropping system. Tillage pans develop easily, but they can be broken up by deep plowing or chiseling. Most crops and pasture plants respond well to additions of lime and fertilizer.

This soil is well suited to pasture. It has few limitations for this use. Applications of fertilizer and lime, however, are needed for optimum growth of grasses and legumes. Suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, ryegrass, tall fescue, southern winterpeas, and white clover. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to woodland. The potential for hardwood trees is high. This soil has few limitations for tree production; however, few areas remain in woodland.

This soil is moderately well suited to urban uses. Moderate shrink-swell potential and moderate permeability are the main limitations. The moderate permeability is a limitation where septic tank absorption fields are installed, but this limitation can be overcome by increasing the size of the absorption field. Building foundations can be designed to offset the affects of shrinking and swelling.

This soil is well suited to recreational development. It has few limitations.

This Gallion soil is in capability class I and woodland group 2o.

Gb—Gallion silty clay loam. This level, well drained soil is on natural levees of the Red River and its distributaries. It is protected from overflows from the Red River by earthern levees. Areas range from about 30 acres to 700 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is brown, medium acid silty clay loam about 6 inches thick. The subsoil is reddish brown, medium acid silty clay loam in the upper part; yellowish red, slightly acid silt loam in the middle part; and reddish brown, neutral silt loam in the lower part. The underlying material to a depth of about 65 inches is yellowish red, mildly alkaline silt loam.

Included with this soil in mapping are a few small areas of Armistead, Latanier, and Moreland soils. These areas make up less than 10 percent of the map unit. All of these soils are on lower positions than Gallion soil, but Armistead soils have a more clayey surface layer, and Latanier and Moreland soils have a more clayey subsoil.

This Gallion soil has medium fertility. Water and air move through the soil at a moderate rate. Water runs off the surface at a slow rate. Adequate water is available to plants in most years. This soil has moderate shrink-swell potential.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture.

This soil is well suited to cultivated crops. Wetness and somewhat poor tilth are the main limitations. Suitable crops are soybeans, corn, cotton, and grain sorghum. Proper arrangement of rows and the use of surface ditches and vegetative cover for outlets help to remove excess surface water. Land grading and smoothing also improves the surface drainage and permits more efficient use of farm equipment. Tillage pans form easily, but they can be broken up by chiseling or subsoiling. Tilth and fertility can be improved by returning crop residue to the soil. Crops respond well to additions of lime and fertilizer.

This soil is well suited to pasture. Suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, ryegrass, tall fescue, southern winterpeas, and white clover. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Applications of fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is well suited to woodland. The potential for hardwood trees is high. Limitations to use and management are few; however, few areas remain in woodland.

This soil is moderately well suited to urban uses. Moderate shrink-swell potential and moderate permeability are the main limitations. Moderate permeability increases the possibility of failure of septic tank absorption fields. This limitation can be overcome, however, by increasing the size of the absorption field. The effects of shrinking and swelling can be minimized

by using proper engineering designs and by backfilling with material that has low shrink-swell potential. Excess water can be removed by using surface ditches and by proper grading.

This soil is well suited to recreational development. It has few limitations for this use.

This Gallion soil is in capability subclass IIw and woodland group 2o.

Gc—Gallion silt loam, occasionally flooded. This level, well drained soil is on natural levees of the Red River and its distributaries. It is not protected by manmade levees and floods occasionally. Areas range from about 20 acres to 400 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is dark grayish brown, medium acid silt loam about 9 inches thick. The subsoil is yellowish red, medium acid silt loam in the upper part and reddish brown, slightly acid silt loam in the lower part. The underlying material to a depth of about 65 inches is yellowish red, mildly alkaline very fine sandy loam.

Included with this soil in mapping are a few small areas of Moreland and Roxana soils. These areas make up about 10 percent of the map unit. Moreland soils are on lower positions than Gallion soils and are in depressional areas. They have more clay throughout than Gallion soils. Roxana soils are on higher positions on the natural levees and have more sand and slightly less clay throughout.

This Gallion soil has medium fertility. Water and air move through this soil at a moderate rate. Water runs off the surface at a slow rate. Adequate water is available to plants in most years. This soil is not adequately protected from flooding. It may flood occasionally on a yearly basis, as well as during the cropping season. This soil has moderate shrink-swell potential.

Most of the acreage of this soil is in pasture. A small acreage is used for cultivated crops.

This soil is well suited to pasture. Suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, ryegrass, tall fescue, and white clover. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Applications of fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is moderately well suited to cultivated crops. It is limited mainly by occasional overflow. In some years crops are damaged by flooding late in spring. Suitable crops are soybeans, grain sorghum, corn, and wheat. Land grading and smoothing improves surface drainage and permits more efficient use of farm equipment. A tillage pan forms easily if this soil is tilled when wet; however, chiseling or subsoiling can be used to break up the tillage pan. Tilth and fertility can be improved by returning crop residue to the soil.

This soil is well suited to woodland. The potential for hardwood trees is high; however, few areas remain in woodland.

This soil is poorly suited to urban uses. Wetness caused by flooding is the main limitation. Large earthern levees are needed to protect this soil from overflows from the Red River.

This soil is moderately well suited to recreational development. Flooding is the main limitation. Protection from flooding is needed.

This soil is in capability sublcass 2w and woodland group 2o.

Gn—Glenmora silt loam, 1 to 3 percent slopes. This very gently sloping, moderately well drained soil is on broad ridges and on side slopes along drainageways in the terrace uplands. Areas range from about 150 acres to 400 acres.

Typically, the surface layer is dark grayish brown, strongly acid silt loam about 5 inches thick. The subsurface layer is brown, medium acid silt loam about 4 inches thick. The subsoil is yellowish brown, medium acid silt loam and silty clay loam in the upper part. The next layer is light brownish gray, mottled, medium acid silty clay loam, and below that is gray and yellowish brown, mottled, medium acid silty clay loam to a depth of about 60 inches. The underlying material to a depth of about 80 inches is yellowish red, mottled, medium acid silty clay.

Included with this soil in mapping are a few small areas of Caddo and Guyton soils. These areas make up about 10 percent of the map unit. The poorly drained Caddo and Guyton soils are on broad flats and in depressional areas and are gray throughout.

This Glenmora soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to most crops. Water and air move through this soil at a slow rate. A seasonal high water table is at a depth of about 2 to 3 feet from December to April. Plants are damaged by lack of water during dry periods in summer and fall of some years. This soil has moderate shrink-swell potential in the upper part of the subsoil and high shrink-swell potential in the lower part.

Most of the acreage of this soil is in woodland. A small acreage is in pasture.

This soil is well suited to woodland. The potential is high for pine trees. Use of equipment is somewhat limited because of wetness. Roads and landings can be protected from erosion by constructing diversions and by seeding cuts and fills. Conventional methods of harvesting timber generally can be used, but their use may be limited during rainy periods. These rainy periods are generally from December to April. Competing vegetation can be controlled by proper site preparation

and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is well suited to pasture. Low fertility and the hazard of erosion are the main limitations. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, tall fescue, vetch, and white clover. Where it is practical, seedbeds should be prepared on the contour or across the slope. Periodic mowing and clipping helps to maintain uniform growth, discourages selective grazing, and reduces clumpy growth. Applications of fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is well suited to cultivated crops. The main crops are soybeans, corn, and small grains. Low fertility, the hazard of erosion, and potentially toxic levels of exchangeable aluminum within the rooting zone are the main limitations. This soil is friable and easy to keep in tood tilth. It can be worked over a wide range of moisture content. Excessive cultivation can result in the formation of a tillage pan, but this pan can be broken by subsoiling when the soil is dry. The use of minimum tillage and returning all crop residue to the soil or regularly adding other organic matter improve fertility and help to maintain soil tilth and content of organic matter. Crops respond well to additions of lime and fertilizer, which help to overcome low fertility and reduce the high levels of exchangeable aluminum. The use of minimum tillage and the construction of terraces, diversions, and grassed waterways help to control erosion. All tillage should be done on the contour or across the slope.

This soil is moderately well suited to urban uses. Wetness and slow permeability are the main limitations. Excess water can be removed by constructing shallow ditches and by proper grading. Slow permeability and the seasonal high water table increase the possibility of failure of septic tank absorption fields. Revegetating disturbed areas around construction sites as soon as possible helps to control soil erosion. The use of sandy backfill for the trench and long absorption lines helps to compensate for the slow permeability.

This soil is moderately well suited to recreational uses. Wetness and slow permeability are the main limitations. Good drainage should be provided for intensively used areas, such as playgrounds.

This Glenmora soil is in capability subclass IIe and woodland group 2w.

Go—Gore silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is in the terrace uplands. Areas range from about 30 acres to 400 acres.

Typically, the surface layer is dark brown, medium acid silt loam about 4 inches thick. The subsurface layer is brown, strongly acid silt loam about 3 inches thick. The subsoil is strong brown, mottled, strongly acid silty clay loam in the upper part; yellowish red, mottled, very strongly acid silty clay in the middle part; and light brownish gray and gray, mottled, very strongly acid and strongly acid silty clay and clay in the lower part. The underlying material to a depth of about 65 inches is yellowish red, mottled, medium acid clay.

Included with this soil in mapping are a few small areas of Guyton and Kolin soils. These areas make up about 25 percent of the map unit. Guyton soils are in depressional areas and are loamy throughout. Kolin soils are on slightly higher ridges and are loamy in the upper part of the subsoil.

This Gore soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to most crops. Water and air move through this soil at a very slow rate. Water runs off the surface at a medium rate. This soil has high shrink-swell potential in the subsoil. Adequate water is available to plants in most years.

Most of the acreage of this soil is in woodland. A small acreage is in pasture.

This soil is moderately well suited to woodland. The potential for pine trees is moderately high. Restricted use of equipment and seedling mortality are the main concerns in producing and harvesting timber. Proper site preparation is needed to offset initial plant competition, and spraying can be used to control the subsequent growth of weeds. Maintaining a proper cutting cycle helps to overcome the limitations to use of equipment during wet periods of the year.

This soil is poorly suited to cultivated crops. Low fertility, the hazard of erosion, and potentially toxic levels of aluminum within the rooting zone are the main limitations. The main crops are soybeans and corn. This soil is easy to work, but it is difficult for crop roots to penetrate the subsoil. The use of minimum tillage and the construction of terraces, diversions, and grassed waterways help to control erosion. Crops respond well to additions of lime and fertilizer, which help to overcome low fertility and reduce the high levels of aluminum.

This soil is well suited to pasture. Low fertility is the main limitation. Erosion is a hazard during the establishment of pasture plants. Suitable pasture plants are bahiagrass, common bermudagrass, improved bermudagrass, coastal bermudagrass, ball clover, and crimson clover. Where it is practical, seedbeds should be prepared on the contour or across the slope. Proper grazing practices, weed control, and additions of fertilizer are needed to produce maximum quality forage.

This soil is poorly suited to urban uses. A clayey subsoil, very slow permeability, and high shrink-swell potential are the main limitations. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. Very slow permeability increases the possibility of failure of septic tank absorption fields. This limitation can be overcome to some extent, however, by increasing the size of the absorption field.

This soil is moderately well suited to recreational development. Very slow permeability is the main limitation. The hazard of erosion is a concern in areas where paths and trails are developed.

This Gore soil is in capability subclass IVe and woodland group 3c.

Gr—Gore silt loam, 5 to 12 percent slopes. This moderately sloping and strongly sloping, moderately well drained soil is on side slopes in the terrace uplands. Areas range from about 15 acres to 200 acres.

The surface layer is dark brown, medium acid silt loam about 4 inches thick. The subsurface layer is pale brown, medium acid very fine sandy loam about 5 inches thick. The subsoil is red, mottled, very strongly acid and strongly acid silty clay in the upper part; light brownish gray, very strongly acid silty clay in the next part; yellowish red, very strongly acid silty clay below that; and yellowish red, medium acid clay in the lower part. The underlying material to a depth of about 80 inches is yellowish red, mottled, medium acid clay.

Included with this soil in mapping are a few small areas of Guyton and Kolin soils. These areas make up about 10 percent of the map unit. Guyton soils are in drainageways and have less clay in the subsoil than Gore soil. Kolin soils are on higher lying ridges and have less clay in the upper part of the subsoil.

This Gore soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to most crops. Water and air move through this soil at a very slow rate. Water runs off the surface at a rapid rate. This soil has high shrink-swell potential in the subsoil. Plants are damaged by lack of water during dry periods in summer and fall of some years.

Most of the acreage of this soil is in woodland. A small acreage is in pasture.

This soil is moderately well suited to woodland. The potential for pine trees is moderately high. Restricted use of equipment and seedling mortality are the main concerns in producing and harvesting timber. Hand planting of nursery stock is often necessary to establish or improve a stand. Because the clayey soil is sticky when wet, planting and harvesting should be done during dry periods.

This soil is generally poorly suited to cultivated crops. The hazard of erosion is usually too severe for this use.

This soil is moderately well suited to pasture. Steep slopes and the severe hazard of erosion are the main limitations. The use of equipment is limited somewhat by steep slopes. Suitable pasture plants are bahiagrass, common bermudagrass, ball clover, and crimson clover. Proper grazing practices, weed control, and additions of fertilizer are needed to produce maximum quality forage.

This soil is poorly suited to urban uses. The clayey subsoil, high shrink-swell potential, and slope are the main limitations. Erosion is a hazard in the steeper areas. Only that part of the site that is used for construction should be disturbed. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. The limitation of very slow permeability can be overcome to some extent by increasing the size of septic tank absorption fields.

This soil is moderately well suited to recreational development. Slope and very slow permeability are the main limitations. Paths and trails should extend across the slope. Plant cover can be maintained by controlling traffic.

This Gore soil is in capability subclass VIe and woodland group 3c.

Gu—Guyton silt loam. This level, poorly drained soil is on broad flats and in depressional areas in the terrace uplands. Areas range from about 20 acres to 200 acres. Slope is dominantly less than 1 percent.

The surface layer is grayish brown, very strongly acid silt loam about 6 inches thick. The subsurface layer is about 18 inches thick. It is light brownish gray, mottled, strongly acid silt loam in the upper part and light gray, mottled, strongly acid silt loam in the lower part. The subsoil to a depth of about 65 inches is grayish brown, mottled, strongly acid and very strongly acid silty clay loam in the upper and middle parts and light grayish brown, mottled, very strongly acid silt loam in the lower part.

Included with this soil in mapping are a few small areas of Caddo and Cahaba soils. These areas make up about 15 percent of the map unit. Caddo soils are on slightly higher positions than Guyton soil, and they have red mottles in the subsoil. Cahaba soils are also on higher positions. They have more sand throughout and are redder in the subsoil than Guyton soil.

This Guyton soil has low fertility and moderately high levels of exchangeable aluminum within the rooting zone that are potentially toxic to some crops. Water and air move through this soil at a slow rate. Water runs off the surface at a slow rate and stands in low places for short periods. A seasonal high water table fluctuates between a depth of about 1.5 feet and the surface from December through May. The surface layer of this soil remains wet for long periods after heavy rains. Adequate water is available to plants in most years. The shrink-swell potential is low.

Most of the acreage of this soil is in woodland. A small acreage is in pasture and cropland.

This soil is well suited to woodland. The potential for pine and hardwood trees is high. Restricted use of equipment and moderately high seedling mortality because of wetness are the main concerns in producing and harvesting timber. Machine planting is practical only in dry years. Conventional methods of harvesting timber generally can be used, but these methods are limited

during the rainy period, which generally extends from December through May.

This soil is moderately well suited to cultivated crops. The main crops are soybeans and corn. Wetness and potentially toxic levels of aluminum within the rooting zone are the main limitations. Surface crusting is also a problem. The surface layer of this soil remains wet for long periods after heavy rains; however, plants generally suffer from lack of water during dry periods in summer and fall of most years. A drainage system is needed for most cultivated crops and pasture plants. Crusting of the surface and compaction can be reduced by returning crop residue to the soil. Crops respond well to additions of lime and fertilizer, which help to overcome the low fertility and moderately high levels of exchangeable aluminum.

This soil is well suited to pasture. Wetness limits the choice of plants and the period of grazing. Suitable pasture plants are bahiagrass, common bermudagrass, white clover, vetch, southern winterpeas, and tall fescue. Grazing when the soil is wet results in compaction of the surface layer. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Additions of fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is poorly suited to urban development and recreational development. Wetness is the main limitation for urban uses. Wetness and very slow permeability are the main limitations for recreational uses. Septic tank absorption fields do not function properly because of wetness and slow permeability. Excess water can be removed by constructing surface ditches and by proper grading.

This Guyton soil is in capability subclass IIIw and woodland group 2w.

GY—Guyton and Cascilla soils, frequently flooded. The level, poorly drained Guyton soil and the well drained Cascilla soil are on narrow flood plains of streams that drain the terrace uplands. Areas range from 40 acres to 2,000 acres. The Guyton soil is on low positions, and the Cascilla soil is on low ridges and on the natural levees near the stream channels. These soils are subject to frequent flooding on a yearly basis, and they are subject to frequent flooding for very brief to very long periods during the cropping season. Some areas of these soils are within an abandoned military bombing range site where there may be unexploded bombs. Slopes are dominantly less than 1 percent.

The Guyton soil makes up about 50 percent of this map unit, and the Cascilla soil makes up about 30 percent. Most mapped areas are made up of both soils, but the proportion of each soil varies from place to place.

The number of observations made in these areas was fewer than in other areas because frequent flooding is a major limitation to use and management of these soils. For this reason, separation of the soils would be of little value to the land user. The detail in mapping, however, is adequate for the expected use of the soils.

Typically, the Guyton soil has a surface layer of brown, strongly acid silt loam about 4 inches thick. The subsurface layer is light brownish gray, mottled, very strongly acid silt loam about 21 inches thick. The subsoil is gray, mottled, very strongly acid silty clay loam in the upper part and gray, mottled, very strongly acid silt loam in the lower part. The underlying material to a depth of about 96 inches is light brownish gray, mottled, very strongly acid silt loam.

The Guyton soil has low fertility and moderately high levels of exchangeable aluminum in the rooting zone that are potentially toxic to some crops. Water and air move through this soil at a slow rate. Water runs off the surface at a slow rate. A seasonal high water table fluctuates between a depth of about 1.5 feet and the surface from December through May. This soil is frequently flooded for periods ranging from very brief to long, mostly in winter and spring. It is flooded more often than 40 times during each 100-year period. Depth of the flood waters ranges from 1 foot to 8 feet. This soil dries slowly after heavy rains.

Typically, the Cascilla soil has a surface layer of dark brown, very strongly acid silt loam about 8 inches thick. The subsoil is dark brown, very strongly acid silt loam in the upper part; yellowish brown, mottled, very strongly acid silt loam in the middle part; and yellowish brown, very strongly acid, mottled silt loam in the lower part. The underlying material to a depth of about 80 inches is yellowish brown, very strongly acid fine sandy loam.

The Cascilla soil has low fertility and high levels of exchangeable aluminum within the rooting zone that are potentially toxic to most crops. Water and air move through this soil at a moderate rate. Water runs off the surface at a slow rate. This soil is frequently flooded for periods ranging from brief to very long, mostly in winter and spring. It is flooded more often than 40 times during each 100-year period. Depth of the flood waters ranges from 1 foot to 8 feet. This soil dries quickly after rains. The shrink-swell potential is low.

Included with these soils in mapping are a few small areas of Caddo and Cahaba soils. These areas make up about 20 percent of the map unit. Caddo soils are on adjacent low stream terraces. They have red mottles in the subsoil and are not subject to flooding. Cahaba soils are also on adjacent low stream terraces. They are of redder hue than Cascilla and Guyton soils and are not subject to flooding.

Most of the acreage of these Guyton and Cascilla soils is in woodland. A small acreage is in pasture.

These soils are moderately well suited to woodland. The potential for hardwoods and pine trees is very high in the Cascilla soil and high in the Guyton soil. Wetness limits the use of equipment, and seedling mortality is

moderately high. Trees should be water-tolerant, and they should be planted or harvested during dry periods. Conventional methods of harvesting timber generally can be used, but use of equipment may be limited during the rainy period, which is generally from December to May. In areas that are in the abandoned military bombing range site, only natural regeneration of vegetation is possible. Harvesting equipment used in these areas is limited to vehicles that have rubber tires.

This map unit generally is moderately well suited to pasture. In areas within the abandoned military bombing range site, however, it is suited only to native grasses. If these soils are used for pasture, the establishment of a suitable stand is difficult because of overflow and low fertility. Wetness limits the choice of plants and the period of grazing. Unexploded bombs are a limitation in areas within the military bombing range site. Suitable pasture plants in areas other than within the bombing range are common bermudagrass, singletary peas, and vetch. Native grasses are best suited to areas within the bombing range. The use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition.

The soils in this map unit generally are poorly suited to cultivated crops. The hazard of flooding is too severe for this use. In addition, areas within the abandoned bombing range site are limited because of the possibility of unexploded bombs.

This map unit is not suited to urban uses. The hazard of flooding is too severe for this use.

This map unit is poorly suited to recreational development. It is limited mainly by the hazard of flooding and wetness. Picnic areas and paths and trails can be developed, but use is limited to dry periods.

These Guyton and Cascilla soils are in capability subclass Vw. The Guyton soil is in woodland group 2w, and the Cascilla soil is in woodland group lw.

Ko—Kolin silt loam, 1 to 3 percent slopes. This very gently sloping, moderately well drained soil is in the terrace uplands. Areas range from about 30 acres to 400 acres.

Typically, the surface layer is dark brown, strongly acid silt loam about 3 inches thick. The subsurface layer is brown, strongly acid silt loam about 3 inches thick. The subsoil to a depth of about 28 inches is strong brown and yellowish brown, strongly acid silty clay loam. It is red, mottled, very strongly acid silty clay in the next layer; strong brown, mottled, strongly acid silty clay in the next layer; and yellowish red, mottled, strongly acid silty clay below that to a depth of about 74 inches.

Included with this soil in mapping are a few small areas of Gore and Guyton soils. These areas make up about 10 percent of the map unit. Gore soils are on side slopes. They have a subsoil that is more clayey in the upper part than that of Kolin soil. Guyton soils are in depressional areas. They are poorly drained and are loamy throughout.

This Kolin soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to most crops. Water and air move through the upper part of the subsoil at a moderately slow rate and through the lower part at a very slow rate. Water runs off the surface at a slow rate. A seasonal high water table fluctuates between a depth of about 1.5 feet and 3 feet from December through April. This soil has moderate shrink-swell potential in the upper part of the subsoil and high shrink-swell potential in the lower part. Plants are damaged by lack of water during dry periods in summer and fall in some years.

Most of the acreage of this soil is in woodland. A small acreage is in pasture.

This soil is moderately well suited to woodland. The potential for pine trees is moderately high. Moderately restricted use of equipment because of wetness is the main management concern. Conventional methods of harvesting timber generally are suitable, but the soil may become compacted if it is wet and heavy equipment is used. Reforestation after harvesting needs to be carefully managed to reduce competition from undesirable understory plants.

This soil is well suited to pasture. Low fertility and a moderate hazard of erosion are the main limitations. Suitable pasture plants are bahiagrass, common bermudagrass, improved bermudagrass, coastal bermundagrass, ball clover, crimson clover, and arrowleaf clover. Applications of lime and fertilizer are needed for good growth of forage plants. Where practical, seedbeds should be prepared on the contour or across the slope. Rotation grazing helps to maintain the quality of forage.

This soil is moderately well suited to cultivated crops. Low fertility, a moderate hazard of erosion, and potentially toxic levels of exchangeable aluminum within the rooting zone are the main limitations. The most suitable crops are soybeans, corn, and sweet potatoes. This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture content. Proper arrangement of rows and the use of surface ditches and vegetative cover for outlets are needed to remove excess surface water. Crop residue left on or near the surface helps to maintain tilth and control erosion. Crops respond to applications of fertilizer and lime, which help to overcome the low fertility and reduce the high levels of exchangeable aluminum.

This soil is poorly suited to urban uses. Wetness, very slow permeability, and high shrink-swell potential are the main limitations. Drainage is needed if roads and building foundations are constructed. Septic tank absorption fields do not function properly during rainy periods because of wetness and very slow permeability. The use of sandy backfill for the trench and long absorption lines helps to compensate for the very slow permeability. If

the density of housing is moderate to high, community sewage sytems are needed to prevent contamination of the water supplies. Buildings and roads can be designed to offset the effects of shrinking and swelling.

This soil is poorly suited to recreational development. Wetness and very slow permeability are the main limitations. Drainage should be provided for camp areas, picnic areas, playgrounds, and trails.

This Kolin soil is in capability subclass IIe and woodland group 3w.

La—Latanier clay. This level, somewhat poorly drained soil is on the alluvial plains of the Red River. Areas range from about 30 acres to 400 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is dark reddish brown, neutral clay about 6 inches thick. The subsoil is reddish brown, moderately alkaline silty clay. The underlying material to a depth of about 65 inches is reddish brown, moderately alkaline silt loam in the upper part and yellowish red, moderately alkaline very fine sandy loam in the lower part.

Included with this soil in mapping are a few small areas of Armistead, Gallion, and Moreland soils. Armistead soils are along former channels of the Red River. They have a thinner clayey subsoil than Latanier soil. Gallion soils are on higher positions and are loamy throughout. Moreland soils are on slightly lower positions than Latanier soil. They have a clayey subsoil and clayey underlying material.

This Latanier soil has high fertility. Water and air move through the soil at a very slow rate. Water runs off the surface at a slow rate and stands in low places for short periods after heavy rains. The surface layer of this soil is very sticky when wet and dries slowly. A seasonal high water table fluctuates between a depth of about 1 foot and 3 feet from December through April. Adequate water is available to plants in most years. The clayey upper part of this soil has very high shrink-swell potential, and the loamy lower part has low shrink-swell potential.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture.

This soil is moderately well suited to crops. The main crops are soybeans and small grains. Wetness, slow intake of water, and poor tilth are the main limitations. This soil is sticky when wet and hard when dry, and it becomes cloddy if tilled when too wet or too dry. Proper arrangement of rows and the use of surface ditches and vegetative cover for outlets are needed to remove excess surface water. Using minimum tillage and returning all crop residue to the soil or regularly adding other organic matter improves fertility and helps to maintain tilth and content of organic matter.

This soil is well suited to pasture. Wetness during the winter months is the main limitation. Grazing when the soil is wet results in compaction of the surface layer. Suitable pasture plants are tall fescue, johnsongrass, and common bermudagrass. White clover, vetch, southern winterpeas, and red clover are adapted cool-season legumes. A properly designed drainage system is needed to remove excessive water on the surface. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to woodland. The potential for hardwood trees is high; however, few areas remain in woodland. If this soil is used for the production of timber, planting and harvesting should be done during dry periods. Reforestation after harvesting needs to be carefully managed to reduce competition from undesirable understory plants.

This soil is poorly suited to urban uses. Wetness, very high shrink-swell potential, and very slow permeability are the main limitations. Drainage is needed to overcome wetness. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. Septic tank absorption fields do not function properly because of wetness and very slow permeability.

This soil is poorly suited to recreational development. Wetness, very slow permeability, and the clay surface layer are the main limitations. Adequate drainage is needed for most recreational uses. Covering the surface with several inches of loamy material helps to reduce the stickiness of the surface layer.

This Latanier soil is in capability subclass IIIw and woodland group 2w.

Ma—Malbis fine sandy loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is in the terrace uplands. Areas range from about 20 acres to 700 acres.

Typically, the surface layer is dark grayish brown, strongly acid fine sandy loam about 6 inches thick. The subsoil extends to a depth of about 64 inches. It is strong brown very strongly acid clay loam in the upper part and yellowish brown, mottled, very strongly acid sandy clay loam in the middle and lower parts.

Included with this soil in mapping are a few small areas of Ruston soils. These areas make up about 10 percent of the map unit. Ruston soils are on more convex slopes than Malbis soil, and they have a redder subsoil that contains less plinthite.

This Malbis soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to most crops. Air and water move through the upper part of the subsoil at a moderate rate and through the lower part at a moderately slow rate. Runoff is medium, and the hazard of water erosion is moderate. A seasonal high water table fluctuates between a depth of about 2.5 feet and 4 feet from December through March. Plants generally suffer from lack of water during dry periods in summer and fall in most years. The shrink-swell potential is low.

Most of the acreage of this soil is in woodland. A small acreage is in pasture and cropland.

This soil is well suited to woodland. The potential for pine trees is high. This soil has few limitations for use and management; however, management that minimizes the risk of erosion should be used in harvesting timber.

This soil is well suited to pasture. Low fertility and slope are the main limitations. Erosion is a hazard during the establishment of grasses. Suitable pasture plants are bahiagrass, common bermudagrass, coastal bermundagrass, improved bermudagrass, ball clover, crimson clover, and arrowleaf clover. Rotation grazing helps to maintain the quality of forage. Applications of fertilizer are needed for optimum growth of grasses and legumes. Where practical, seedbeds should be placed on the contour or across the slope.

This soil is well suited to cultivated crops. The main crops are soybeans, corn, and sweet potatoes (fig. 1). Low fertility, lack of moisture in some years, a moderate hazard of erosion, and potentially toxic levels of exchangeable aluminum within the rooting zone are the main limitations. This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture content. Maintaining crop residue on or near the surface reduces runoff and helps to maintain tilth and organic matter content. Farming on the contour also helps to control runoff and erosion (fig. 2). Most crops respond well to additions of lime and fertilizer, which help to overcome the low fertility and reduce the high levels of exchangeable aluminum.

This soil is moderately well suited to urban uses. Wetness and moderately slow permeability are limitations if this soil is used for septic tank absorption fields. Use of sandy backfill for the trench and long absorption lines helps to compensate for the slow permeability. There are few limitations for building sites. Preserving the existing plant cover during construction helps to control erosion.

This soil is well suited to recreational development. Erosion and sedimentation can be controlled and the beauty of the area enhanced if adequate plant cover is maintained.

This Malbis soil is in capability subclass IIe and woodland group 2o.

Me—Mayhew silty clay loam. This nearly level, poorly drained soil is on broad interstream divides in terrace uplands. Areas range from about 20 acres to 500 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is dark grayish brown, very strongly acid silty clay loam about 5 inches thick. The subsoil to a depth of about 75 inches is gray and light brownish gray, mottled, very strongly acid and strongly acid silty clay in the upper and middle parts and mottled, gray and yellowish brown, very strongly acid silty clay in the lower part.

Included with this soil in mapping are a few small areas of Cadeville, Kisatchie, and Metcalf soils. These areas make up about 15 percent of the map unit. The moderately well drained Cadeville soils are on steeper side slopes. They have a redder subsoil than Mayhew soils. The well drained Kisatchie soils are also on steeper side slopes and are underlain by sandstone or siltstone at moderate depths. The somewhat poorly drained Metcalf soils are on slightly higher ridgetops. They have a browner subsoil than Mayhew soils.

This Mayhew soil has low fertility and high levels of exchangeable aluminum within the rooting zone that are potentially toxic to most crops. Water and air move through the soil at a very slow rate. Water runs off the surface at a slow rate and stands in low places for long periods after heavy rains. A seasonal high water table fluctuates from the surface to a depth of about 1 foot below the surface from January through March. This soil has high shrink-swell potential. Adequate water is available to plants in most years.

Most of the acreage of this soil is within the Kisatchie National Forest and is in woodland. A small acreage is privately owned and is in pasture.

This soil is well suited to woodland. The potential for pine and hardwood trees is high. Wetness limits the use of equipment. Conventional methods of harvesting timber generally can be used, but use may be limited during rainy periods. This period generally extends from January to April. Competing vegetation, such as weeds, brush, or unwanted trees, can be controlled by proper site preparation and by spraying, cutting, or girdling.

This soil is well suited to pasture. Low fertility and wetness are the main limitations. Suitable pasture plants are bahiagrass, common bermudagrass, improved bermudagrass, ball clover, arrowleaf clover, crimson clover, singletary peas, vetch, and tall fescue. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Additions of fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is moderately well suited to cultivated crops. The main crops are soybeans and small grains. Low fertility, wetness, and potentially toxic levels of exchangeable aluminum within the rooting zone are the main limitations. This soil becomes cloddy if farmed when it is too wet or too dry. Proper arrangement of rows, and the use of surface ditches and vegetative cover for outlets are needed to remove excess surface water. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Most crops respond well to additions of lime and fertilizer, which help to overcome the low fertility and high levels of exchangeable aluminum.

This soil is poorly suited to urban uses. Wetness, very slow permeability, and high shrink-swell potential are the main limitations. Drainage is needed if roads and building

foundations are constructed. Very slow permeability and the high water table increase the possibility of failure of septic tank absorption fields. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

This soil is poorly suited to recreational development. Very slow permeability and wetness are the main limitations. Adequate drainage should be provided for camp areas, picnic areas, and playgrounds.

This Mayhew soil is in capability subclass IIIw and woodland group 2w.

Mf—Metcalf very fine sandy loam. This nearly level, somewhat poorly drained soil is on ridge crests and flat interstream divides in the terrace uplands. Areas range

Figure 1.—Sweet potatoes growing on Malbis fine sandy loam, 1 to 5 percent slopes.

Figure 2.—Soybeans planted on the contour help to control erosion on this area of Malbis fine sandy loam, 1 to 5 percent slopes.

from about 20 acres to 400 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is brown, very strongly acid very fine sandy loam about 4 inches thick. The subsurface layer is light yellowish brown, very strongly acid silt loam about 3 inches thick. The subsoil to a depth of about 37 inches is yellowish brown and light brownish gray, very strongly acid and strongly acid loam and silt loam. The subsoil between depths of 37 and 61 inches is light brownish gray, mottled, very strongly acid and extremely acid clay loam. The underlying material to a depth of about 75 inches is light brownish gray, mottled, extremely acid clay.

Included with this soil in mapping are a few small areas of Cadeville and Mayhew soils. These areas make up about 10 percent of the map unit. The moderately well drained Cadeville soils are on side slopes along drainageways. They are clayey throughout the subsoil.

The poorly drained Mayhew soils are on broad interstream divides. They are gray throughout.

This Metcalf soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to most crops. Water and air move through the soil at a very slow rate. Water runs off the surface at a medium rate. A seasonal high water table fluctuates between a depth of about 1.5 and 2.5 feet from December through April. The surface layer of this soil remains wet for long periods after heavy rains. This soil has low shrink-swell potential in the upper part of the subsoil and high shrink-swell potential in the lower part. Adequate water is available to plants in most years.

Most of the acreage of this soil is in woodland. A small acreage is in pasture and cropland.

This soil is well suited to woodland. The potential for pine trees is high. Wetness limits the use of equipment. Conventional methods of harvesting timber generally can be used, but their use may be limited during rainy periods. This period generally extends from December to April.

This soil is well suited to pasture. Wetness limits the choice of plants and the period of grazing. Suitable pasture plants are bahiagrass, common bermudagrass, improved bermudagrass, white clover, southern winterpeas, vetch, and tall fescue. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture and the soil in good condition. Additions of fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is moderately well suited to cultivated crops. The main crops are soybeans, corn, and small grains. Low fertility, wetness, and potentially toxic levels of exchangeable aluminum within the rooting zone are the main limitations. Proper arrangement of rows and the use of surface ditches and vegetative cover for outlets are needed to remove excess surface water. Use of minimum tillage and return of all crop residue to the soil or the regular addition of other organic matter improves fertility and helps to maintain tilth and content of organic matter. Crops respond to additions of lime and fertilizer, which help to overcome the low fertility and reduce the high levels of exchangeable aluminum.

This soil is poorly suited to urban uses. Wetness is the main limitation. Excess water can be removed by constructing shallow ditches and by proper grading. Where this soil is used for septic tank absorption fields, sandy backfill placed in the trench and long absorption lines help to conpensate for the very slow permeability.

This soil is poorly suited to recreational development. Wetness and very slow permeability are the main limitations. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This Metcalf soil is in capability subclass IIIw and woodland group 2w.

Mn—Moreland silt loam, overwash. This level, somewhat poorly drained soil is on the lower parts of natural levees of the Red River and its distributaries. Areas range from about 50 acres to 250 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is about 11 inches thick. It is dark brown, neutral silt loam in the upper part and dark reddish brown, slightly acid silt loam in the lower part. The subsoil to a depth of about 65 inches is reddish brown, neutral clay in the upper part and reddish brown, mildly alkaline clay and silty clay in the lower part.

Included with this soil in mapping are a few small areas of Moreland silty clay loam and Norwood and Roxana soils. These areas make up about 10 percent of the map unit. Moreland silty clay loam is in a slightly lower position than Moreland silt loam, overwash. The well drained Norwood and Roxana soils are on slightly higher positions. They are on the natural levees and are loamy throughout.

This Moreland soil has high fertility. Water and air move though the soil at a very slow rate. Water runs off the surface at a slow rate. A seasonal high water table fluctuates between a depth of about 1.5 feet and the surface from December to April. This soil has low shrink-swell potential in the surface layer and very high shrink-swell potential in the subsoil. Flooding is rare on a yearly basis and during the cropping season but may occur after severe and unusual storms. Adequate water is available to plants in most years.

Most of the acreage of this soil is in cultivated crops. A small acreage is in pasture.

This soil is moderately well suited to cultivated crops. The main crops are soybeans and small grains. Wetness is the main limitation. Proper arrangement of rows and the use of surface ditches and vegetative cover for outlets are needed to remove excess water. Land grading and smoothing also helps to remove excess water. Crop residue left on or near the surface helps to maintain tilth and control erosion.

This soil is well suited to pasture. Wetness limits the choice of plants and the period of grazing. Suitable pasture plants are improved bermudagrass, common bermudagrass, dallisgrass, ryegrass, tall fescue, red clover, white clover, southern winterpeas, and vetch. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture.

This soil is well suited to woodland. The potential is high for hardwood trees. Most areas, however, have been cleared for use as cropland. Wetness limits the use of equipment. Seedling mortality is moderate. Trees should be water-tolerant, and they should be planted or harvested during dry periods. If site preparation is not adequate, competition from undesirable plants can

prevent or prolong natural or artificial reestablishment of trees.

This soil is poorly suited to urban uses. Very high shrink-swell potential, flooding, and wetness are the main limitations. Drainage is needed if roads and building foundations are constructed. Use of sandy backfill for the trench and long absorption lines helps to compensate for the very slow permeability. The effects of shrinking and swelling can be minimized by using proper engineering design and by backfilling with material that has low shrink-swell potential. Constructing ring levees around urban areas can prevent damage to buildings from flooding.

This soil is poorly suited to recreational development. Wetness, flooding, and very slow permeability are the main limitations. A properly designed drainage system helps to improve most recreational areas.

This Moreland soil is in capability subclass IIIw and woodland group 2w.

Mo—Moreland silty clay loam. This level, somewhat poorly drained soil is on the lower parts of natural levees of the Red River and its distributaries. Areas range from about 15 acres to 400 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is about 12 inches thick. It is dark brown, mildly alkaline silty clay loam in the upper part and dark reddish brown, mildly alkaline silty clay loam in the lower part. The subsoil to a depth of about 65 inches is reddish brown, moderately alkaline silty clay in the upper part; dark reddish brown, moderately alkaline clay and silty clay in the middle part; and reddish brown, moderately alkaline silty clay in the lower part.

Included with this soil in mapping are a few small areas of Gallion, Norwood, and Moreland silt loam soils. These areas make up about 10 percent of the map unit. The well drained Gallion and Norwood soils are on slightly higher parts of the natural levees and are loamy throughout. The Moreland silt loam soils are on slightly higher positions than Moreland silty clay loam.

This Moreland soil has high fertility. Water and air move through the soil at a very slow rate. Water runs off the surface at a slow rate. This soil dries slowly after heavy rains. A seasonal high water table fluctuates between a depth of about 1.5 feet and the surface from December to April. This soil has moderate shrink-swell potential in the surface layer and very high shrink-swell potential in the subsoil. Flooding is rare on a yearly basis and during the cropping season but may occur during severe and unusual storms. Adequate water is available to plants in most years.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture.

This soil is moderately well suited to cultivated crops. The main crops are soybeans and small grains. Wetness is the main limitation. Maintaining tilth is a minor concern. Proper arrangement of rows and the use of surface ditches and vegetative cover for outlets are needed to remove excess surface water. Land grading and smoothing also help to remove excess water. Crop residue left on or near the surface helps to maintain tilth and control erosion.

This soil is well suited to pasture. Wetness, however, limits the choice of plants and the period of grazing. Suitable pasture plants are common bermudagrass, dallisgrass, ryegrass, tall fescue, white clover, red clover, southern winterpeas, and vetch. Grazing when the soil is wet results in compaction of the surface layer. Excessive water on the surface can be removed by constructing surface ditches. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to woodland. It has high potential for hardwood trees. Wetness and restricted use of equipment are the main concerns in producing and harvesting timber. Proper site preparation is needed to offset initial plant competition, and spraying can be used to control subsequent growth. Conventional methods of harvesting timber generally can be used, but use may be limited during rainy periods. The rainy season is generally from December to April.

This soil is poorly suited to urban uses. Wetness, flooding, and very high shrink-swell potential are the main limitations. Excess water can be removed by constructing surface ditches and by providing the proper grade. Use of sandy backfill for the trench and long absorption lines helps to compensate for the very slow permeability. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

This soil is poorly suited to recreational facilities. Wetness, flooding, and very slow permeability are the main limitations. A properly designed drainage system improves this soil for use as playgrounds, picnic areas, camp areas, and trails.

This Moreland soil is in capability subclass IIIw and woodland group 2w.

Mr—Moreland clay. This level soil is in backswamps on the alluvial plain of the Red River. Areas range from about 30 acres to 600 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is about 10 inches thick. It is dark brown, neutral clay in the upper part and dark reddish brown, mildly alkaline clay in the lower part. The subsoil to a depth of about 66 inches is reddish brown, mildly alkaline clay in the upper part; dark reddish brown and reddish brown, mildly alkaline and moderately alkaline clay in the middle part; and reddish brown, mildly alkaline silty clay in the lower part. In places the subsoil has thin layers of gray silty clay or silty clay loam.

Included with this soil in mapping are a few small areas of Armistead, Gallion, Latanier, Moreland silt loam,

and Moreland silty clay loam soils. These areas make up about 10 percent of the map unit. The somewhat poorly drained Armistead and Latanier soils are on slightly higher positions than Moreland clay, and they are underlain by loamy alluvium. The well drained Gallion soils are on natural levees and are loamy throughout. Moreland silt loam and Moreland silty clay loam soils are on slightly higher positions than Moreland clay.

This Moreland soil has high fertility. Water and air move through the soil at a very slow rate. Water runs off the surface at a slow rate and stands in low places for long periods after heavy rains. The surface layer of this soil is sticky when wet and hard when dry. A seasonal high water table fluctuates between a depth of about 1.5 feet and the surface from December to April. This soil swells and shrinks markedly upon wetting and drying. It is subject to rare flooding after severe and unusual storms on a yearly basis as well as during the cropping season. Adequate water is available to plants in most years.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture and woodland.

This soil is moderately well suited to cultivated crops. The level terrain and high natural fertility favor the growth of crops. Wetness and poor tilth are the main limitations. The main suitable crops are soybeans and small grains. This soil is difficult to keep in good tilth. It can be worked only within a narrow range of moisture content. Proper arrangement of rows and the use of surface ditches and vegetative cover for outlets are needed to remove excess surface water. Land grading and smoothing also help to remove excess water. Leaving crop residue on or near the surface helps to maintain tilth.

This soil is well suited to pasture. Wetness is the main limitation. Wetness limits the choice of plants and the period of grazing. The main suitable pasture plants are common bermudagrass, dallisgrass, ryegrass, tall fescue, white clover, vetch, southern winterpeas, and red clover. Grazing when the soil is wet results in compaction of the surface layer. Excessive water on the surface can be removed by using a properly designed drainage system. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to woodland. It has high potential for hardwoods. Most areas, however, have been cleared for use as cropland. Wetness and restricted use of equipment are the main concerns in producing and harvesting timber. Because the clayey surface layer is sticky when wet, most planting and harvesting equipment can be used only during dry periods.

This soil is poorly suited to urban uses. Wetness, flooding, and very high shrink-swell potential are the main limitations. Drainage is needed if roads and building foundations are constructed. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. Flooding can be controlled by constructing levees.

This soil is poorly suited to recreational development. Flooding, wetness, very slow permeability, and the clayey surface texture are the main limitations. Installing a drainage system and coating the surface with several inches of loamy material improve areas to be used for playgrounds, picnic areas, and camp areas.

This Moreland soil is in capability subclass IIIw and woodland group 2w.

Mt—Moreland clay, gently undulating. This gently undulating, somewhat poorly drained soil is in backswamps on the alluvial plain of the Red River. The landscape is one of parallel low ridges and swales. Areas range from 30 acres to 600 acres. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark brown, neutral clay about 5 inches thick. The next layer is dark reddish brown, mildly alkaline silty clay about 7 inches thick. The subsoil to a depth of about 65 inches is reddish brown, moderately alkaline clay in the upper part and reddish brown, moderately alkaline silty clay in the lower part. In places a buried gray surface layer is at a depth of about 50 inches.

This Moreland soil has high fertility. Water and air move through the soil at a very slow rate. Water runs off the surface at a slow rate and stands in low places for long periods after heavy rains. A seasonal high water table fluctuates between a depth of about 1.5 feet and the surface from December to April. The surface layer of this soil is sticky when wet and hard when dry. This soil has very high shrink-swell potential. Flooding is rare on a yearly basis and during the cropping season but may occur after severe and unusual storms. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of Gallion and Latanier soils. These areas make up about 10 percent of the map unit. The well drained Gallion soils are on higher positions on natural levees and are loamy throughout. The somewhat poorly drained Latanier soils are on slightly higher positions than Moreland clay and are underlain by loamy alluvium at moderate depths.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture and woodland.

This soil is moderately well suited to cultivated crops. Short irregular slopes, poor tilth, and wetness are the main limitations. The main suitable crops are soybeans and small grains. The surface layer becomes cloddy if farmed when it is too wet or too dry. Tillage operations are hindered on this soil by the irregular slopes. Surface drainage can be improved by land grading and

smoothing, but in places the movement of large amounts of soil will be needed. Tilth can be improved by returning crop residue to the soil.

This soil is well suited to pasture. Wetness is the main limitation. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. The main suitable pasture plants are common bermudagrass, dallisgrass, ryegrass, tall fescue, and white clover. Excessive water on the surface can be removed by using a properly designed drainage system. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture.

This soil is well suited to woodland. It has high potential for hardwood trees. Wetness, however, limits the use of equipment. Because the clayey surface layer is sticky when wet, most planting and harvesting equipment can be used only during dry periods.

This soil is poorly suited to urban uses. Wetness, flooding, and very high shrink-swell potential are the main limitations. Excess water can be removed by using surface ditches and providing the proper grade. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. Protection from flooding is needed in areas where buildings and sanitary facilities are constructed.

This soil is poorly suited to recreational uses. Wetness, flooding, and very slow permeability are the main limitations. Areas used for playgrounds and picnic areas can be improved by covering the area with several inches of loamy material.

This Moreland soil is in capability subclass IIIw and woodland group 2w.

Mw—Moreland clay, occasionally flooded. This level soil is on the flood plains between the Red River and the protection levee, below the spillways of Iatt and Nantachie Lakes, and in depressional areas along Bayou Rigolette. It is subject to occasional flooding for brief to long periods. Areas range from about 20 acres to 400 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is about 11 inches thick. It is dark brown, neutral clay in the upper part and dark reddish brown, neutral clay in the lower part. The subsoil to a depth of about 65 inches is reddish brown, mildly alkaline clay in the upper part and dark reddish brown, moderately alkaline silty clay and clay in the lower part.

Included with this soil in mapping are a few areas of Armistead, Gallion, Latanier, and Yorktown soils. These areas make up about 15 percent of the map unit. The somewhat poorly drained Armistead and Latanier soils are on slightly higher positions than this Moreland clay, and they are underlain by loamy alluvium at moderate depths. The well drained Gallion soils are on natural levees on higher positions and are loamy throughout. The very poorly drained Yorktown soils are ponded. They are in backswamps, sloughs, and abandoned channels and have a grayer subsoil than this Moreland clay.

This Moreland soil has high fertility. Water and air move through this soil at a very slow rate. Water runs off the surface at a slow rate and stands in low places for long periods after heavy rains. This soil is subject to occasional flooding on a yearly basis. It is subject to occasional flooding for brief to long periods during the cropping season. The surface layer of this soil is sticky when wet and hard when dry. A seasonal high water table fluctuates between a depth of about 1.5 feet and the surface from December to April. The soil swells and shrinks markedly upon wetting and drying. Adequate water is available to plants in most years.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture and woodland.

This soil is moderately well suited to cultivated crops. The main crops are soybeans and small grains. The level terrain and high fertility provide favorable conditions for the growth of crops. Wetness, the hazard of flooding, and poor tilth are the main concerns. This soil is difficult to keep in good tilth. It can be worked only within a narrow range of moisture content. Proper arrangement of rows and the use of surface ditches and vegetative cover for outlets are needed to remove excess surface water. Land grading and smoothing also help to remove excess water. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth.

This soil is moderately well suited to pasture. Wetness and the hazard of flooding are the main limitations. Wetness limits the choice of plants and the period of grazing. The main suitable pasture plants are common bermudagrass, dallisgrass, ryegrass, white clover, and tall fescue. Grazing when the soil is wet results in compaction of the surface layer. The fertility level generally is sufficient for sustained production of high quality, nonirrigated pasture. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition.

This soil is moderately well suited to woodland. It has moderately high potential for hardwood trees. Most areas, however, have been cleared for use as cropland. Severe seedling mortality and restricted use of equipment because of wetness are the main concerns in producing and harvesting timber. Trees should be water-tolerant, and they should be planted or harvested during dry periods. Because the clayey soil is sticky when wet, most planting and harvesting equipment can be used only during dry periods.

This soil is poorly suited to urban uses. The hazard of flooding, wetness, very high shrink-swell potential, and

very slow permeability are the main limitations. Protection from flooding is needed in areas where buildings are constructed.

This soil is poorly suited to recreational development. The hazard of flooding, wetness, and the clayey surface layer are the main limitations.

This Moreland soil is in capability subclass IVw and woodland group 3w.

Nd—Norwood silt loam. This level, well drained soil is on natural levees of the Red River and its distributaries. It is protected from flooding by manmade levees. Areas range from about 15 acres to 300 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is reddish brown, mildly alkaline silt loam about 8 inches thick. The subsoil is yellowish red, moderately alkaline silty clay loam. The underlying material to a depth of about 66 inches is reddish brown, moderately alkaline silt loam and silty clay loam.

Included with this soil in mapping are a few small areas of Gallion, Moreland, Norwood silty clay loam, and Roxana soils. These areas make up about 15 percent of the map unit. Gallion soils are on positions similar to those of Norwood soils, but they have a subsoil that is more acid. Moreland soils are on lower positions and have a clayey subsoil. Norwood silty clay loam soils are in slightly lower positions. Roxana soils are on slightly higher positions closer to the river than Norwood soils and have less clay between depths of 10 and 40 inches.

This Norwood soil has high fertility. Water and air move through this soil at a moderate rate. Water runs off the surface at a slow rate. This soil dries quickly after rains. Adequate water is available to plants during most years. This soil has low shrink-swell potential.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture.

This soil is well suited to cultivated crops. The main crops are cotton, soybeans, corn, wheat, oats, and grain sorghum. The soil has few limitations. It is friable and easy to keep in good tilth, and it can be worked over a wide range of moisture content. Excessive cultivation can result in the formation of a tillage pan, but this pan can be broken by subsoiling when the soil is dry. Returning crop residue to the soil or regularly adding other organic matter helps to maintain tilth and fertility.

This soil is well suited to pasture. It has high fertility and a long level terrain. Suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, ryegrass, tall fescue, white clover, and southern winterpeas. Use of proper stocking rates and pasture rotation helps to keep the pasture and the soil in good condition. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture.

This soil is well suited to woodland. It has very high potential for hardwood trees. This soil has few limitations for use and management.

The soil is well suited to urban uses. Erosion is a slight hazard on disturbed areas. Revegetating disturbed areas around construction sites as soon as possible helps to control soil erosion. Moderate permeability is a moderate limitation if septic tank absorption fields are installed. Increasing the length of the absorption lines helps to compensate for the moderate permeability of the soil.

This soil is well suited to recreational development. It has few limitations for this use. Erosion may be a slight hazard in areas where paths and trails are used. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This Norwood soil is in capability class I and woodland group 1o.

No—Norwood silty clay loam. This level, well drained soil is on natural levees of the Red River and its distributaries. It is protected from flooding by manmade levees. Areas range from about 15 acres to 150 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is reddish brown, mildly alkaline silty clay loam about 8 inches thick. The subsoil is yellowish red, moderately alkaline silty clay loam. The underlying material to a depth of about 67 inches is yellowish red, moderately alkaline silt loam in the upper part; reddish brown, moderately alkaline silt loam in the middle part; and yellowish red, moderately alkaline silty clay loam in the lower part.

Included with this soil in mapping are a few small areas of Gallion, Latanier, Moreland, Norwood silt loam, and Roxana soils. They make up about 15 percent of the map unit. The Gallion soils are on positions similar to those of Norwood soil, but they have a subsoil that is more acid. Latanier and Moreland soils are on lower positions and have a more clayey subsoil. Norwood silt loam soils are on slightly higher positions. Roxana soils are on higher positions on natural levees than Norwood soil and have less clay between depths of 10 and 40 inches.

This Norwood soil has high fertility. Water and air move through the soil at a moderate rate. Water runs off the surface at a slow rate and stands in low places for short periods after heavy rains. The shrink-swell potential is moderate in the surface layer and low in the underlying material. Adequate water is available to plants in most years.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture.

This soil is well suited to cultivated crops. The main crops are soybeans, cotton, corn, wheat, oats, and grain sorghum. High fertility and the long, level terrain provide favorable conditions for the growth of crops. Wetness is the main limitation. Land grading and smoothing helps to remove excess water. A tillage pan forms easily if this soil is tilled when wet, but chiseling or subsoiling can break up the tillage pan. Crop residue left on or near the

surface helps to conserve moisture, maintain tilth, and control erosion.

This soil is well suited to pasture. Suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, ryegrass, tall fescue, and white clover. Grazing when the soil is wet compacts the surface layer. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture.

This soil is well suited to woodland. It has very high potential for hardwood trees. Most areas, however, have been cleared for use as cropland. Conventional methods of harvesting timber generally are suitable, but the soil may become compacted if it is wet and heavy equipment is used.

This soil is well suited to urban uses. Moderate permeability is the main limitation. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. If septic tanks are installed, increasing the length of the absorption field helps to overcome the limitation of moderate permeability.

This soil is well suited to recreational uses. It has few limitations.

This Norwood soil is in capability subclass IIw and woodland goup 1o.

Nr—Norwood silt loam, gently undulating. This gently undulating, well drained soil is on natural levees of the Red River and its distributaries. It is protected from flooding by manmade levees. The landscape is one of parallel low ridges and swales. The ridges range from 3 to 5 feet high and are 100 to 200 feet wide. The swales are about 50 to 100 feet wide. Areas range from about 20 acres to 200 acres. Slopes range from 0 to 3 percent.

Typically, the surface layer is reddish brown, mildly alkaline silt loam about 13 inches thick. The subsoil is yellowish red, moderately alkaline silt loam. The underlying material to a depth of about 75 inches is yellowish red, moderately alkaline silty clay loam in the upper part; yellowish red, moderately alkaline silt loam in the middle part; and reddish brown, moderately alkaline very fine sandy loam in the lower part.

Included with this soil in mapping are a few small areas of Gallion, Norwood silty clay loam, and Roxana soils. These areas make up about 20 percent of the map unit. Gallion soils are on positions similar to those of Norwood soil, but they have a subsoil that is more acid. Norwood silty clay loam soils are in some of the swales. Roxana soils are on higher positions than this Norwood soil. They are on the crests of ridges and have less clay in the subsoil and underlying material.

This Norwood soil has high fertility. Water and air move through the soil at a moderate rate. Water runs off the surface at a slow rate and stands in low places for short periods after heavy rains. The shrink-swell potential is low. Adequate water is available to plants in most years.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture.

This soil is well suited to cultivated crops. The main crops are soybeans, corn, wheat, oats, and grain sorghum. Tillage operations are hindered to some extent by the irregular slopes. The hazard of erosion on the ridges and wetness in the swales are the main limitations. Surface drainage can be improved by land grading and smoothing, but in places the movement of large amounts of soil will be needed. Excessive cultivation can result in the formation of a tillage pan, but this pan can be broken by subsoiling when the soil is dry. Crusting of the surface and erosion can be reduced by returning crop residue to the soil and by using minimum tillage.

This soil is well suited to pasture. Suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, ryegrass, tall fescue, and white clover. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture.

This soil is well suited to woodland. It has very high potential for hardwood trees. Most areas, however, have been cleared for use as cropland and pastureland. Conventional methods of harvesting timber generally are suitable, but the soil may become compacted if it is wet and heavy equipment is used.

This soil is well suited to urban uses. Moderate permeability and wetness in the swales are the main limitations. Excess water can be removed by using surface ditches. Moderate permeability is a limitation if septic tanks are installed. This limitation can be overcome by increasing the length of the absorption field.

This soil is well suited to recreational development. Wetness in the swales is the main limitation. Erosion is a slight hazard in intensively used areas. A properly designed drainage system is needed in most areas. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This Norwood soil is in capability subclass IIe and woodland group 1o.

Pt—Pits, gravel. These pits are open excavations, ranging from 10 to 35 feet deep, from which gravel and sand have been removed. They range from 4 to 60 acres. Mounds of spoil are around most of the pits. These pits are mainly in areas of Briley, Ruston, and Smithdale soils.

Gravel pits are areas from which gravelly and sandy material has been excavated for use in roads, driveways,

and parking areas. The sand is used as a mixture for hot mix, concrete, and mortar sand. A mixture of sand, clay, and gravel, locally called "pitrun," is also used as building material.

Most areas of this map unit are bare of vegetation. Scattered trees and sparse stands of grass grow in a few of the abandoned pits.

Gravel pits are not suited to cropland, woodland, pasture, or to urban uses and recreational uses unless major reclamation is done.

Pits, gravel, is in capability subclass VIIs. It is not assigned to a woodland suitability group.

RK—Rigolette-Kisatchie association, hilly. The somewhat poorly drained Rigolette soil and the well drained Kisatchie soil are in the terrace uplands. The landscape is one of narrow ridgetops and moderately sloping to steep side slopes. It is dissected by many narrow drainageways. A few stones and boulders and outcrops of sandstone and siltstone are at the surface in most areas. Areas, which range from about 80 acres to 500 acres, are about 35 percent Rigolette soil and about 30 percent Kisatchie soil.

The Rigolette soil is on plane and concave side slopes and midslope benches. Slopes range from 5 to 15 percent. The Kisatchie soil is on convex, upper and lower side slopes. Slopes range from 5 to 30 percent.

The number of observations made in these areas was fewer than in other areas because steep slopes, depth to rock, and rock outcrops are major limitations to the use and management of these soils. For this reason, separation of the soils would be of little value to the land user. In addition, some areas are in an abandoned military bombing range site where use and management are severely limited because of the possibility of unexploded bombs. The detail in mapping, however, is adequate for the expected use of these soils.

Typically, the Rigolette soil has a surface layer of grayish brown, strongly acid loamy fine sand about 4 inches thick. The subsurface layer is light brownish gray, mottled, strongly acid loamy fine sand about 8 inches thick. The subsoil is light brownish gray, mottled, very strongly acid fine sandy loam in the upper part; gray, mottled, very strongly acid sandy clay loam in the middle part; and light gray, mottled, very strongly acid silty clay in the lower part. The underlying material to a depth of about 75 inches is light gray and light brownish gray, mottled, very strongly acid silty clay and clay. In places the underlying material has small to large fragments of sandstone or siltstone.

The Rigolette soil has low fertility and high levels of exchangeable aluminum within the rooting zone. Water and air move through the subsoil at a moderate rate and through the underlying material at a very slow rate. The underlying material is extremely hard when dry, and it remains dry most of the time. Water runs off the surface at a medium rate. A water table is perched upon the clayey underlying material from December to April. Effective rooting depth ranges from about 20 to 40 inches. The subsoil has moderate shrink-swell potential. Plants are damaged because of lack of water during dry periods in summer and fall of most years.

Typically, the Kisatchie soil has a surface layer about 8 inches thick. It is very dark gray, very strongly acid very fine sandy loam in the upper part and dark grayish brown, very strongly acid very fine sandy loam in the lower part. The subsoil is grayish brown, very strongly acid clay loam in the upper part and pale brown, very strongly acid silty clay in the lower part. The underlying material to a depth of about 60 inches is olive, extremely acid sandstone.

The Kisatchie soil has low fertility and high levels of exchangeable aluminum within the rooting zone. Water and air move through the soil at a very slow rate. Runoff is rapid and very rapid. Effective rooting depth ranges from about 20 to 40 inches. The soil dries quickly after rains. It has high shrink-swell potential in the subsoil. Plants are damaged because of lack of water during dry periods in summer and fall of most years.

Included with these soils in mapping are many small areas of Briley, Cadeville, Ruston, and Smithdale soils. Cadeville soils are on plane and convex side slopes and are clayey throughout. Briley, Ruston, and Smithdale soils are on narrow ridgetops and upper side slopes and have less clay in the subsoil than Rigolette and Kisatchie soils. In places all of the included soils are underlain by large fragments of sandstone or siltstone at depths ranging from 30 to 50 inches below the surface. Also included are many small areas where sandstone or siltstone crops out at the surface. A few small seep areas that are very wet most of the time are on midslope benches. The included soils make up about 25 percent of the unit.

All of the acreage of these soils is in woodland. It is mainly in pine trees, but some areas are in mixed hardwood and pine stands.

These soils are poorly suited to woodland. They have low potential for pine trees. Moderate seedling mortality and a moderate hazard of erosion are the main concerns in producing and harvesting timber. The use of equipment is moderately limited in the steeper areas because of sandstone and siltstone outcrops and steepness of slopes. Trees are subject to windthrow because of limited rooting depth. Conventional methods of harvesting generally can be used, but wetness limits the use of equipment during the winter and spring in areas of the Rigolette soil. In those areas that are within the abandoned military bombing range site, the use of equipment for site preparation is limited because of the possibility of unexploded bombs. Reestablishment of trees after harvest is possible only by natural regeneration.

These soils are generally poorly suited to improved pasture, and they are not suited to improved pasture in

areas within the old military bombing range site. Low fertility, steep slopes, sandstone or siltstone outcrops, and limited choice of pasture plants are the main limitations. Suitable pasture plants are common bermudagrass and bahiagrass. Use of proper grazing practices, weed control, and additions of fertilizer are needed to produce maximum quality forage.

These soils are poorly suited to cultivated crops. They are limited mainly by steep slopes, sandstone or siltstone outcrops, low fertility, and low to moderate available water capacity. Cultivation is not feasible in areas that are within the military bombing range site because of the possibility of unexploded bombs.

These soils are poorly suited to urban uses. They are not suited to areas that are within the old military bombing range site. Steep slopes, rock outcrops, wetness, very slow permeability, and high shrink-swell potential are the main limitations. Erosion is a hazard in the steeper areas. Only that part of the site used for construction should be disturbed. Structures to divert runoff are needed if buildings and roads are to be constructed. Reestablishment of plants is difficult in areas that have had the surface layer removed and the subsoil exposed, but mulching and fertilizing the cut areas help to establish the plants. Seepage from sanitary facilities would be difficult to control because of the steepness of slopes. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

These soils are poorly suited to recreational development. Wetness is a limitation in the Rigolette soil. Slope and very slow permeability are limitations in areas of both Rigolette and Kisatchie soils. Erosion and sedimentation can be controlled and the beauty of the area enhanced if adequate plant cover is maintained. Paths and trails should extend across the slope where possible. Drainage is needed if intensively used areas such as playgrounds are located on the Rigolette soil.

These Rigolette and Kisatchie soils are in capability subclass VIe and woodland suitability group 5d.

Rm—Roxana very fine sandy loam. This level, well drained soil is on natural levees of the Red River and its distributaries. Areas range from about 15 acres to 500 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is yellowish red, neutral very fine sandy loam about 6 inches thick. The underlying material to a depth of about 65 inches is yellowish red, moderately alkaline very fine sandy loam, loamy very fine sand, and silt loam. In places the surface layer is calcareous.

Included with this soil in mapping are a few small areas of Gallion, Latanier, Moreland, and Norwood soils. These areas make up about 10 percent of most mapped areas. Gallion soils are on slightly lower positions than Roxana soil, and they have a subsoil that is more acid. Latanier and Moreland soils are on lower positions and have a more clayey subsoil. Norwood soils are on slightly lower positions and have more clay in the profile between depths of 10 and 40 inches.

This Roxana soil has high fertility. Water and air move through this soil at a moderate rate. Water runs off the surface at a slow rate. This soil dries quickly after rains. A seasonal high water table fluctuates between depths of about 4 and 6 feet from December to April. Plants are damaged because of lack of water during dry periods in summer and fall of some years. This soil has low shrink-swell potential.

Most of the acreage of this soil is used for cultivated crops. A small acreage is in pasture.

This soil is well suited to cultivated crops. The main crops are soybeans, cotton, corn, wheat, oats, and grain sorghum. This soil has few limitations. It is friable and easy to keep in good tilth and can be worked over a wide range of moisture content. Excessive cultivation can result in the formation of a tillage pan, but this pan can be broken by subsoiling when the soil is dry. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This soil is well suited to pasture. It has few limitations for this use. Suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, ryegrass, tall fescue, and white clover. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture and the soil in good condition. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture.

This soil is well suited to woodland. It has very high potential for hardwood trees. All areas, however, have been cleared for use as cropland and pastureland. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is moderately well suited to urban uses. It has few limitations for use as building sites and roads; however, wetness and moderate permeability are limitations if the soil is used for most sanitary facilities. Wetness and moderate permeability increase the possibility of failure of septic tank absorption fields, but these limitations can be overcome by increasing the length of the absorption lines.

This soil is well suited to recreational facilities, such as playgrounds, paths, picnic areas, and camp areas. It has few limitations for these uses.

This Roxana soil is in capability class I and woodland group 1o.

Rn—Roxana very fine sandy loam, occasionally flooded. This gently undulating, well drained soil is on the natural levee of the Red River. It is between the river channel and the protection levee and is subject to occasional flooding. Areas range from about 15 acres to 350 acres. The landscape is one of low parallel ridges

and swales. The ridges range from 3 to 5 feet high and are 100 to 200 feet wide. The swales are about 100 to 150 feet wide. Slopes range from 0 to 3 percent.

Typically, the surface layer is reddish brown, mildly alkaline very fine sandy loam about 5 inches thick. The underlying material to a depth of about 65 inches is brown, moderately alkaline very fine sandy loam in the upper part; yellowish red, moderately alkaline loamy very fine sand in the middle part; and yellowish red, moderately alkaline silt loam and very fine sandy loam in the lower part.

Included with this soil in mapping are a few small areas of Norwood soils and soils that have a thin overwash of silty clay or silty clay loam but otherwise are similar to the Roxana soils. These areas make up about 10 percent of the map unit. Norwood soils are on slightly lower positions and have more clay in the underlying material between depths of 10 and 40 inches. The soils that are similar to Roxana soil have more clay in the overwash on the surface and are in some of the swales.

This Roxana soil has high fertility. Water and air move through this soil at a moderate rate. Water runs off the surface at a slow rate and stands in the swales for short periods after heavy rains. A seasonal high water table fluctuates between depths of about 4 feet to 6 feet from December to April. These soils are subject to occasional flooding on a yearly basis. They are also subject to occasional flooding for brief periods during the cropping season. This soil dries quickly after rains. Plants are damaged because of lack of water during dry periods in summer and fall of some years. This soil has low shrink-swell potential.

Most of the acreage of this soil is in pasture and woodland. A small acreage is used for cropland.

This soil is well suited to pasture. It has high fertility. Flooding is the main limitation. Suitable pasture plants are improved bermudagrass, common bermudagrass, tall fescue, and white clover. During periods of flooding cattle need to be moved to adjacent protected areas or to pastures at a higher elevation. Periodic mowing and clipping helps to maintain uniform growth, discourages selective grazing, and reduces clumpy growth.

This soil is well suited to woodland. It has very high potential for hardwood trees. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Conventional methods of harvesting timber generally are suitable, but these operations may be delayed during periods of flooding.

This soil is well suited to cultivated crops. The main crops are soybeans, cotton, corn, wheat, oats, and grain sorghum. Flooding and gently undulating slopes are the main limitations. This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture content. Irregular slopes hinder tillage operations. Crops are damaged in some years by flooding late in spring. Land grading and smoothing help to remove excess surface water. Excessive cultivation can result in the formation of a tillage pan, but this pan can be broken by subsoiling when the soil is dry. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This soil is poorly suited to urban uses. Wetness and moderate permeability are limitations in areas where sanitary facilities are constructed. This soil can be protected against flooding if ring levees are constructed around the areas. Wetness and moderate permeability increase the possibility of failure of septic tank absorption fields.

This soil is moderately well suited to recreational development. Flooding is the main limitation. Areas need to be protected from flooding for most recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced if adequate plant cover is maintained.

This Roxana soil is in capability subclass IIw and woodland group 1o.

Ro—Roxana very fine sandy loam, frequently flooded. This gently undulating, well drained soil is in low areas near the channel of the Red River. It is subject to frequent flooding for brief to long periods. Areas range from about 20 acres to 300 acres. Slopes range from 0 to 3 percent.

Typically, the surface layer is yellowish red, mildly alkaline very fine sandy loam about 5 inches thick. The underlying material to a depth of about 65 inches is brown, moderately alkaline loamy very fine sand in the upper part; brown, moderately alkaline very fine sandy loam in the middle part; and yellowish red, moderately alkaline very fine sandy loam in the lower part.

Included with this soil in mapping are a few small areas of soils that have a thin overwash of silty clay and silty clay loam but otherwise are similar to Roxana soil. These areas make up about 15 percent of the map unit. The included soils are in lower positions than Roxana soil.

This Roxana soil has high fertility. Water and air move through this soil at a moderate rate. The soil dries quickly after rains. Water runs off the surface at a slow rate and stands in low places for long periods after floods and heavy rains. A seasonal high water table fluctuates between depths of about 4 feet to 6 feet from December to April. This soil is subject to frequent flooding on a yearly basis. It is also subject to frequent flooding for brief to long periods during the cropping season. Plants are damaged because of lack of water during dry periods in summer and fall of some years.

All of the acreage of this soil is in woodland and pasture.

This soil is well suited to woodland. It has very high potential for hardwood trees; however, flooding interferes with management operations. Competing vegetation can be controlled by proper site preparation and by spraying,

cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is moderately well suited to pasture. Flooding is the main limitation. The period of grazing and choice of pasture plants are limited because of flooding. A suitable pasture plant is common bermudagrass. Periodic mowing and clipping helps to maintain uniform growth, discourages selective grazing, and reduces clumpy growth. During periods of flooding cattle need to be moved to adjacent protected areas or to pasture at a higher elevation.

This soil is generally not suited to cultivated crops. The hazard of flooding is too severe for this use.

This soil is generally not suited to urban and recreational uses. The hazard of flooding is too severe for these uses.

This Roxana soil is in capability subclass Vw and woodland group 1o.

Rp—Ruston fine sandy loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on narrow ridgetops in the terrace uplands. Areas range from about 10 acres to 350 acres.

Typically, the surface layer is about 4 inches thick. It is brown, strongly acid fine sandy loam. The subsurface layer is light yellowish brown, strongly acid fine sandy loam about 10 inches thick. The subsoil extends to a depth of about 75 inches. It is reddish brown, very strongly acid sandy clay loam in the upper part; yellowish red, very strongly acid fine sandy loam in the middle part; and red, very strongly acid sandy clay loam in the lower part.

Included with this soil in mapping are a few small areas of Briley, Malbis, and Smithdale soils. These areas make up about 10 percent of the map unit. Malbis soils are on the more nearly level parts of ridgetops. They have plinthite nodules in the subsoil. Smithdale soils are on steeper side slopes. They have less clay in the lower part of the subsoil than Ruston soil. Briley soils are mainly on some of the narrow ridgetops. They are sandy to a depth ranging from 20 to 40 inches below the surface.

This Ruston soil has low fertility and moderately high levels of exchangeable aluminum within the rooting zone that are potentially toxic to some crops. Water and air move through this soil at a moderate rate. Runoff is medium, and the hazard of water erosion is moderate. This soil dries quickly after rains. Plants are damaged because of lack of water during dry periods in summer and fall of some years. This soil has low shrink-swell potential.

Most of the acreage of this soil is in woodland. Small acreages are used for pasture and for cropland.

This soil is well suited to woodland. It has high potential for pine trees. This soil has few limitations for use and management. Management that minimizes the risk of erosion is important in harvesting timber. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is well suited to pasture. Low fertility and the hazard of erosion when pasture plants are being established are the main limitations. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, ball clover, and crimson clover. Additions of fertilizer and lime are needed for optimum growth of grasses and legumes. Seedbeds should be prepared on the contour or across the slope where it is practical. Rotation grazing helps to maintain the quality of forage.

This soil is moderately well suited to cultivated crops. The main crops are sweet potatoes, watermelons, soybeans, corn, and cotton. Low fertility, slope, and potentially toxic levels of exchangeable aluminum within the rooting zone are the main limitations. This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture content. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. The use of minimum tillage and the construction of terraces and grassed waterways also help to control erosion. Most crops respond well to additions of lime and fertilizer, which help to overcome the low fertility and moderately high levels of exchangeable aluminum.

This soil is moderately well suited to urban uses. Moderate permeability is a limitation if septic tank absorption fields are installed, but this limitation can be overcome by increasing the size of the absorption field. The hazard of erosion is a limitation in areas where buildings are constructed. Revegetating disturbed areas around construction sites as soon as possible helps to control soil erosion. Plant cover can be established and maintained by proper fertilizing, seeding, mulching, and shaping of the slopes.

This soil is well suited to recreational uses. It has few limitations. Erosion can be controlled and the beauty of the area enhanced if adequate plant cover is maintained.

This Ruston soil is in capability subclass IIIe and woodland group 2o.

RR—Ruston-Cadeville association, moderately rolling. The well drained Ruston soil and the moderately well drained Cadeville soil are in the terrace uplands and are within an abandoned military bombing range site. The landscape is one of very gently sloping to gently sloping ridgetops and moderately sloping to strongly sloping side slopes. Areas, which range from 100 acres to 640 acres, are about 45 percent Ruston soil and about 40 percent Cadeville soil.

The Ruston soil is on convex ridgetops that are generally less than 300 feet wide. Slopes range from 1 to 5 percent. The Cadeville soil is on short, complex side slopes that are dissected by many short drainageways

and intermittent streams. Slopes range from 5 to 12 percent.

The number of observations made in these areas was fewer than in other areas because the possibility of unexploded bombs severely restricts accessibility and limits the use and management of the soils. The detail in mapping, however, is adequate for the expected use of the soils.

Typically, the Ruston soil has a surface layer of dark grayish brown, strongly acid fine sandy loam about 5 inches thick. The subsurface layer is light yellowish brown, strongly acid fine sandy loam about 5 inches thick. The subsoil extends to a depth of about 80 inches. It is yellowish red, strongly acid sandy clay loam in the upper part; yellowish red, strongly acid fine sandy loam in the middle part; and yellowish red, very strongly acid fine sandy loam in the lower part. In places small amounts of gravel are throughout the profile.

The Ruston soil has low fertility and moderately high levels of exchangeable aluminum within the rooting zone that are potentially toxic to some crops. Water and air move through this soil at a moderate rate. Water runs off the surface at a medium rate. This soil dries quickly after rains. Plants generally are damaged because of lack of water during dry periods in summer and fall of most years. The shrink-swell potential is low.

Typically, the Cadeville soil has a surface layer of dark grayish brown, strongly acid very fine sandy loam about 4 inches thick. The subsurface layer is yellowish brown, strongly acid very fine sandy loam about 3 inches thick. The subsoil is yellowish red, mottled, strongly acid silty clay in the upper part and light brownish gray, mottled, very strongly acid clay in the lower part. The underlying material to a depth of about 65 inches is brownish gray, mottled, very strongly acid silty clay.

The Cadeville soil has low fertility and moderately high levels of exchangeable aluminum within the rooting zone that are potentially toxic to some crops. Water and air move through this soil at a very slow rate. Water runs off the surface at a rapid rate. This soil has high shrink-swell potential in the subsoil. Plants generally are damaged because of lack of water during dry periods in summer and fall of most years.

Included with these soils in mapping are a few small areas of Briley, Malbis, and Smithdale soils. These areas make up about 15 percent of the map unit. Briley soils are on narrow, convex ridgetops and upper side slopes. They have a sandy surface layer and a sandy subsurface layer. Malbis soils are on broad ridgetops and on the lower parts of some side slopes. They have plinthite nodules in the subsoil and are loamy throughout. Smithdale soils are midway on the side slopes and are loamy throughout.

The entire acreage of these soils is in woodland within an abandoned military bombing range site in the national forest.

Unless all unexploded bombs are removed, these soils are not suited to cropland, pasture, urban uses, or recreational development.

These soils are well suited to woodland. Ruston soil has high potential for pine trees, and Cadeville soil has moderately high potential for pine trees. Restricted use of equipment because of the hazard of live explosives is the main concern in producing and harvesting timber. Harvesting equipment is limited to vehicles that have rubber tires. Reestablishment of trees after harvest is possible only by natural regeneration.

These Ruston and Cadeville soils are in capability subclass IVe. The Ruston soil is in woodland group 2o, and the Cadeville soil is in woodland group 3c.

RS—Ruston-Smithdale association, moderately rolling. The well drained Ruston and Smithdale soils are in the terrace uplands and are within an abandoned military bombing range site. The landscape is one of gently sloping ridgetops and moderately sloping side slopes. Areas, which range from 150 to 640 acres, are about 50 percent Ruston soil and about 35 percent Smithdale soil.

The Ruston soil is on the narrow ridgetops. The Smithdale soil is on short side slopes that are dissected by many short drainageways and intermittent streams.

The number of observations made in these areas was fewer than in other areas because the possibility of unexploded bombs severely restricts accessibility and limits the use and management of the soils. The detail in mapping, however, is adequate for the expected use of the soils. Slopes range from 1 to 8 percent.

Typically, the Ruston soil has a surface layer of dark grayish brown, strongly acid fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown, strongly acid fine sandy loam about 4 inches thick. The subsoil extends to a depth of about 75 inches. It is red and yellowish red, very strongly acid sandy clay loam in the upper part; and yellowish red and red, very strongly acid sandy clay loam in the lower part. In places small amounts of gravel are throughout the profile.

The Ruston soil has low fertility and moderately high levels of exchangeable aluminum within the rooting zone that are potentially toxic to some crops. Water and air move through this soil at a moderate rate. Water runs off the surface at a medium rate. This soil dries quickly after rains. Plants generally are damaged because of lack of water during dry periods in summer and fall of most years. The shrink-swell potential is low.

Typically, the Smithdale soil has a surface layer of dark grayish brown, strongly acid fine sandy loam about 6 inches thick. The subsoil extends to a depth of about 72 inches. It is red, strongly acid sandy clay loam in the upper part; yellowish red, and yellowish red and strong brown, strongly acid sandy loam in the lower part. In places small amounts of gravel are throughout the profile.

The Smithdale soil has low fertility and high levels of exchangeable aluminum within the rooting zone that are potentially toxic to most crops. Water and air move through this soil at a moderate rate. Runoff is rapid, and the hazard of water erosion is severe. This soil dries quickly after rains. Plants generally are damaged because of lack of water during summer and fall of most years. The shrink-swell potential is low.

Included with these soils in mapping are a few small areas of Briley, Cadeville, and Malbis soils. These areas make up about 15 percent of the map unit. Briley soils are on narrow ridgetops. They have a sandy surface layer and a sandy subsurface layer. Cadeville soils are on the lower part of side slopes. They have more clay in the subsoil than Ruston and Smithdale soils. Malbis soils are on broader ridgetops. They have plinthite in the subsoil.

These soils are entirely in woodland. All of the areas are in an abandoned military bombing range site within the boundaries of a national forest.

Unless all unexploded bombs are removed, these soils are not suited to cropland, pasture, urban uses, or recreational development.

These soils are well suited to woodland. They have high potential for pine trees. Restricted use of equipment because of the hazard of live explosives is the main concern in producing and harvesting timber. Harvesting equipment is limited to vehicles that have rubber tires. Reestablishment of trees after harvest is possible only by natural regeneration.

These Ruston and Smithdale soils are in capability subclass IVe and woodland group 2o.

Sm—Smithdale fine sandy loam, 5 to 12 percent slopes. This moderately sloping to strongly sloping, well drained soil is on side slopes in the terrace uplands. Areas range from about 40 acres to 500 acres.

Typically, the surface layer is dark brown, strongly acid fine sandy loam about 4 inches thick. The subsurface layer is yellowish brown, strongly acid fine sandy loam about 5 inches thick. The subsoil to a depth of about 65 inches is yellowish red, strongly acid sandy clay loam in the upper part; yellowish red, strongly acid sandy loam in the middle part; and red, strongly acid sandy loam in the lower part. In places small amounts of gravel are throughout the profile.

Included with this soil in mapping are a few small areas of Briley, Cadeville, and Ruston soils. These areas make up about 15 percent of the map unit. Briley soils are on ridgetops and side slopes and are generally near the heads of drainageways. They are sandy to depths of 20 to 40 inches. Cadeville soils are on the lower part of side slopes and have more clay in the subsoil than Smithdale soils. Ruston soil are on ridgetops and have more clay in the lower part of the subsoil.

This Smithdale soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to most crops. Water and air move through the soil at a moderate rate. Runoff is rapid, and the hazard of water erosion is severe. This soil dries quickly after rains. Plants generally are damaged because of lack of water during dry periods in summer and fall of most years. The shrink-swell potential is low.

Most of the acreage of this soil is in woodland. A small acreage is in pasture.

This soil is well suited to woodland. It has high potential for pine trees. Management that minimizes the risk of erosion is important in harvesting timber. Roads and landings can be protected from erosion by constructing diversions and by seeding cuts and fills. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is well suited to pasture. Low fertility and a severe hazard of erosion during seedbed preparation are the main limitations. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Additions of fertilizer and lime are needed for optimum growth of grasses and legumes. Where practical, seedbeds should be prepared on the contour or across the slopes. Periodic mowing and clipping helps to maintain uniform growth, discourages selective grazing, and reduces clumpy growth.

This soil is poorly suited to cultivated crops. Low fertility, a severe hazard of erosion, and potentially toxic levels of aluminum within the rooting zone are the main limitations. The main suitable crops are sweet potatoes, watermelons, and small grains. This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture content. Erosion can be reduced if fall grain is seeded early, minimum tillage is used, terraces are constructed, and tillage and seeding are on the contour or across the slopes. In addition, waterways should be shaped and seeded to perennial grass.

This soil is moderately well suited to urban uses. Slope and moderate permeability are the main limitations. If this soil is used for septic tank absorption fields, effluent can surface in downslope areas and create a health hazard. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. Plant cover can be established and maintained through proper fertilizing, seeding, mulching, and shaping of the slopes.

This soil is moderately well suited to recreational development. Slope is the main limitation. Erosion and sedimentation can be controlled and the beauty of the area enhanced if adequate plant cover is maintained.

This Smithdale soil is in capability subclass IVe and woodland group 2o.

St—Sumter Variant silty clay loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on plane and convex slopes in the terrace uplands. Areas range from about 5 acres to 60 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline silty clay loam about 6 inches thick. The subsoil is light yellowish brown, moderately alkaline silty clay in the upper part and pale yellow, moderately alkaline silty clay in the middle and lower parts. The underlying material to a depth of about 60 inches is pale yellow, moderately alkaline silty clay.

Included with this soil in mapping are a few small areas of Cadeville and Vaiden soils. The included soils make up about 15 percent of the map unit. The Cadeville soils are on lower parts of the side slopes and are acid throughout. Vaiden soils are on plane and concave slopes. They are more acid than Sumter soils.

This Sumter Variant soil has medium fertility. Water runs off the surface at a medium rate. This soil has high shrink-swell potential. Plants generally are damaged because of lack of water during dry periods in summer and fall of most years.

Most of the acreage of this soil is in native grass pasture and woodland. A small acreage is in improved pasture.

This soil is moderately well suited to cultivated crops, but no areas are cultivated. Medium fertility and a moderate hazard of erosion are the main limitations. This soil is sticky when wet and hard when dry, and it becomes cloddy if tilled when too wet or too dry. The use of minimum tillage and the construction of terraces, diversions, and grassed waterways help to control erosion. Using minimum tillage and returning all crop residue to the soil or regularly adding other organic matter improves fertility and helps to maintain tilth and content of organic matter.

This soil is poorly suited to woodland. It has low potential for most kinds of trees. Eastern redcedar is the most suitable tree species. The hazard of erosion, seedling mortality, and restricted use of equipment are moderate limitations.

This soil is moderately well suited to pasture. Medium fertility and a narrow choice of high quality plants are the main limitations. Suitable pasture plants are johnsongrass, bahiagrass, and King Ranch bluestem. Proper grazing practices, control of weeds, and additions of fertilizer are needed to produce maximum quality forage.

This soil is poorly suited to urban uses. If this soil is used for homesites, high shrink-swell is the main limitation. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. Using sandy backfill for the trench and long absorption lines helps to compensate for the slow permeability in areas where septic tanks are installed. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

This soil is moderately well suited to recreational development. Slow permeability is the main limitation. Erosion and sedimentation can be controlled and the beauty of the area enhanced if adequate plant cover is maintained.

This Sumter soil is in capability subclass IIIe and woodland group 4c.

Un—Una silty clay, frequently flooded. This level, poorly drained soil is on the broad alluvial plains of the Little River. Areas range from about 50 acres to 2,000 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is gray, strongly acid silty clay about 6 inches thick. The subsoil to a depth of about 80 inches is dark gray, very strongly acid silty clay in the upper part and gray, very strongly acid silty clay in the middle and lower parts. In places the surface layer is covered with a thin overwash of silt loam and silty clay loam.

Included with this soil in mapping are a few small areas of Guyton and Urbo Variant soils. These areas make up about 15 percent of the map unit. Both of these soils are on higher positions than Una soil and are loamy throughout.

This Una soil has medium fertility. Water and air move through the soil at a very slow rate. Water runs off the surface at a very slow rate and stands in low places for long periods after heavy rains. A seasonal high water table fluctuates between depths of about 1 foot and 1.5 feet from November to April. The surface layer of this soil is very sticky when wet and hard when dry. The shrink-swell potential is high. This soil is subject to frequent flooding on a yearly basis. It is also subject to frequent flooding for brief to long periods during the cropping season. Flood waters typically range from 10 to 15 feet deep but may exceed a depth of 20 feet in places. Adequate water is available to plants in most years.

Most of the acreage of this soil is in woodland. A small acreage is in native grass pasture.

This soil is moderately well suited to woodland. It has high potential for hardwood trees, but management is difficult. Seedling mortality and restricted use of equipment because of wetness and flooding are the main concerns in producing and harvesting timber. Only trees that can tolerate seasonal wetness should be planted. Conventional methods of harvesting timber generally can be used, but use may be restricted during the rainy period, generally from November to April.

This soil is poorly suited to pasture. Wetness, the limited period of grazing, and a narrow choice of pasture plants are the main limitations. Suitable pasture plants are common bermudagrass and vetch. During periods of flooding, cattle should be moved to adjacent protected areas or to pastures at a higher elevation.

This soil is generally poorly suited to cultivated crops. The hazard of flooding is too severe for this use.

This soil is generally not suited to urban uses and recreational development. The hazard of flooding is too severe for these uses. Wetness and the high shrink-swell

potential are additional limitations. Major flood control structures combined with extensive local drainage systems are needed to protect this soil from flooding.

This Una soil is in capability subclass Vw and woodland group 2w.

Uo—Urbo Variant silty clay loam, occasionally flooded. This very gently sloping, somewhat poorly drained soil is on low ridges within the alluvial plain of the Little River. Areas range from about 15 acres to 250 acres. Slopes range from 1 to 3 percent.

Typically, the surface layer is dark grayish brown, strongly acid silty clay loam about 4 inches thick. The subsoil is grayish brown, mottled, strongly acid silty clay loam in the upper part; grayish brown, mottled, very strongly acid silty clay loam in the middle part; and light brownish gray, mottled, very strongly acid sandy clay loam in the lower part. The underlying material to a depth of about 70 inches is gray, mottled, very strongly acid fine sandy loam. In some of the lower positions, this soil has a thin overwash of silt loam or silty clay on the surface.

Included with this soil in mapping are a few small areas of Guyton and Una soils. These areas make up about 15 percent of the map unit. Guyton soils are on the alluvial fans of tributary streams and have a grayer subsoil than Urbo Variant soil. Una soils are on lower positions and are clayey throughout.

This Urbo Variant soil has medium fertility. Water and air move through the soil at a slow rate. Water runs off the surface at a slow rate and stands in low places for short periods after heavy rains. A seasonal high water table fluctuates between depths of about 1 foot to 2 feet from the surface from December to April. The surface layer of the soil is very sticky when wet and hard when dry. This soil is subject to frequent flooding on a yearly basis. It is subject to occasional flooding for brief to very long periods during the cropping season. Flood waters typically range from 2 to 6 feet deep but may exceed a depth of 10 feet in places. The shrink-swell potential is moderate in the subsoil. Adequate water is available to plants in most years.

Most of the acreage of this soil is in woodland. A small acreage is in pasture. Seasonal cottages have been built on a few areas along the Little River.

This soil is well suited to woodland. It has moderately high potential for hardwood trees. Restricted use of equipment is the main concern in producing and harvesting timber. Only trees that can tolerate seasonal wetness should be planted. Conventional methods of harvesting timber generally can be used, but use may be limited during the rainy period, generally from December to April.

This soil is moderately well suited to pasture. Wetness and flooding limit the period of grazing and the choice of suitable pasture plants. Suitable pasture plants are common bermudagrass, vetch, and native grasses. Grazing when the soil is wet results in compaction of the surface layer. During periods of flooding, cattle should be moved to adjacent protected areas or to pastures at a higher elevation.

This soil is poorly suited to cultivated crops. Wetness, the hazard of flooding, and medium fertility are the main limitations. Crops that can be planted late in spring, such as soybeans and small grains, are best suited.

This soil is not suited to urban uses and recreational development. The hazard of flooding is too severe for these uses.

This soil is in capability subclass IVw and woodland group 3w.

Va—Vaiden silty clay, 1 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad interstream divides in the terrace uplands. Areas range from about 40 acres to 300 acres.

Typically, the surface layer is very dark grayish brown, strongly acid clay about 3 inches thick. The subsoil is yellowish brown, mottled, strongly acid clay. The underlying material to a depth of about 75 inches is gray, mottled, medium acid clay in the upper part and mottled, pale brown, gray, yellowish brown, and strong brown, mildly alkaline clay in the middle and lower parts.

Included with this soil in mapping are a few small areas of Cadeville and Sumter soils. These areas make up about 10 percent of the map unit. Cadeville soils are on the lower part of the side slopes and are acid throughout. Sumter soils are on slightly higher positions and are limy throughout.

This Vaiden soil has low fertility. Water and air move through the soil at a very slow rate. Water runs off the surface at a slow rate. A seasonal high water table fluctuates between depths of about 1 foot and 2 feet below the surface from November to March. This soil has very high shrink-swell potential. Plants generally are damaged because of lack of water during dry periods in summer and fall of most years.

The entire acreage of this soil is in woodland.

This soil is moderately well suited to cultivated crops. The main crops are corn and soybeans. Most areas of this soil, however, are within the boundaries of the national forest and are not likely to be cultivated. Poor tilth, low fertility, and a moderate hazard of erosion are the main limitations. This soil is sticky when wet and hard when dry and tends to become cloddy if tilled when too wet or too dry. Seeding early in the fall, using minimum tillage, and constructing terraces, diversions, and grassed waterways help to control erosion.

This soil is moderately well suited to woodland. It has moderately high potential for pine trees. Restricted use of equipment and seedling mortality are the main concerns in producing and harvesting timber. Wetness limits the use of equipment. Competing vegetation can be controlled by proper site preparation and by spraying,

cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is moderately well suited to pasture. Low fertility and a moderate hazard of erosion are the main limitations. Suitable pasture plants are johnsongrass, vetch, and bahiagrass. Additions of lime and fertilizer promote good growth of forage plants. Where it is practical, seedbeds should be prepared on the contour or across the slope.

This soil is poorly suited to urban uses. Wetness and very high shrink-swell potential are the main limitations. Drainage is needed if roads and building foundations are constructed. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

This soil is poorly suited to recreational development. Wetness, very slow permeability, and a clayey surface layer are the main limitations. If this soil is used for recreational development, a well designed drainage system is needed. The soil can be improved for use as picnic areas and playgrounds if the surface is covered with a layer of loamy material.

This Vaiden soil is in capability subclass IIIe and woodland group 3c.

Yo—Yorktown silty clay. This level, very poorly drained soil is in low backswamps, sloughs, and abandoned channels of the Red River and its distributaries. It is frequently flooded and ponded for very long periods. Areas range from about 20 acres to 240 acres. Slope is dominantly less than 1 percent.

Typically, the surface layer is grayish brown, medium acid silty clay about 5 inches thick. The subsoil to a depth of about 65 inches is gray and dark gray, mottled, slightly acid and neutral clay in the upper and middle parts and reddish brown, mottled, moderately alkaline clay in the lower part.

Included with this soil in mapping are a few small areas of Armistead, Latanier, and Moreland soils. All of these soils are on higher positions than Yorktown soils. Armistead and Latanier soils have loamy underlying material and are not subject to flooding. Moreland soils have a redder subsoil.

This Yorktown soil has high fertility. Water and air move through this soil at a very slow rate. This soil is covered with water ranging from 6 inches to 5 feet in depth during at least 10 months of most years. This soil is subject to frequent flooding on a yearly basis. It is also subject to flooding for very long periods during the cropping season. The shrink-swell potential is very high.

Most of the acreage of this soil is in woodland. The vegetation is aquatic. This area is used as habitat for wildlife and for recreation.

This soil is poorly suited to woodland. It has low potential for hardwood trees. Restricted use of equipment and seedling mortality are the main concerns in producing and harvesting timber. Only trees that can tolerate seasonal wetness should be planted.

This soil is generally not suited to pasture and cultivated crops. The hazard of ponding and flooding are too severe for these uses.

This soil is not suited to urban uses and recreational development. The hazards of ponding and flooding are too severe for these uses.

This Yorktown soil is in capability subclass VIIw and woodland group 4w.

Prime Farmland

Prime farmland, as defined by the U.S. Department of Agriculture, is that land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high crop yields if acceptable farming methods are used. Prime farmland produces the highest yields with minimal inputs of energy and money, and farming it results in the least damage to the environment. Prime farmland is of major importance in satisfying the nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and it should be used with wisdom and foresight.

Prime farmland does not include any soil now being used for urban and built-up land or water areas. It includes only those prime farmland soils that are now used for cropland, pastureland, or woodland.

Prime farmland soils usually have an adequate and dependable supply of moisture from precipitation. They have favorable temperature and growing season length and acceptable reaction. They have few or no rocks and are permeable to water and air. These soils are not excessively erodible or saturated with water for long periods and generally are not frequently flooded during the growing season. Slopes range mainly from 0 to 6 percent. More detailed information on the criteria for prime farmland can be obtained from the local Soil Conservation Service.

About 207,411 acres, or nearly 49 percent, of Grant Parish meets the soil requirements for prime farmland. Areas are scattered throughout the parish. About 18,000 acres of this farmland is used for crops.

The trend of land use to urban and related uses has resulted in the loss of some prime farmland. This loss puts pressure on marginal land, which generally is more erodible, droughty, and difficult to cultivate, and usually is less productive.

The soils that make up prime farmland in Grant Parish are listed in this section. This list does not constitute a recommendation for a particular land use. The percentage of each listed map unit is shown in table 5. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units."

Soils that have limitations—a seasonal high water table, flooding, or inadequate moisture—may qualify for prime farmland if these limitations are overcome by drainage or flood control. However, only those soils that have few limitations and need no additional improvements to qualify for prime farmland are included.

The following map units meet the soil requirements for prime farmland, unless it is urban or built-up land. Urban and built-up land is any contiguous unit of land 10 acres or more that is used as residential sites, industrial sites, commercial sites, construction sites, institutional sites, public administrative sites, railroad yards, small parks, cemeteries, airports, golf courses, sanitary landfills, sewage treatment plants, water control structures and spillways, or similar uses.

Ad	Armistead clay
Ca	Caddo silt loam
Ch	Cahaba fine sandy loam, 1 to 3 percent slopes
Ga	Gallion silt loam
Gb	Gallion silty clay loam
Gc	Gallion silt loam, occasionally flooded
Gn	Glenmora silt loam, 1 to 3 percent slopes
Gu	Guyton silt loam
Ko	Kolin silt loam, 1 to 3 percent slopes
La	Latanier clay
Ma	Malbis fine sandy loam, 1 to 5 percent slopes
Me	Mayhew silty clay loam
Mf	Metcalf very fine sandy loam
Mn	Moreland silt loam, overwash
Mo	Moreland silty clay loam
Mr	Moreland clay
Mt	Moreland clay, gently undulating
Nd	Norwood silt loam
No	Norwood silty clay loam
Nr	Norwood silt loam, gently undulating
Rm	Roxana very fine sandy loam
Rn	Roxana very fine sandy loam, occasionally flooded
Rp	Ruston fine sandy loam, 1 to 5 percent slopes
St	Sumter Variant silty clay loam, 1 to 5 percent slopes
Va	Vaiden silty clay, 1 to 5 percent slopes

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 30,105 acres in Grant Parish was used for crops and pasture in 1978, according to the United States Census of Agriculture. About 19,058 acres was used for crops, mainly soybeans, and more than 11,047 acres was used for pasture. The acreage in crops has been gradually increasing as woodland and pastureland have been converted to use as cropland.

Differences in crop suitability and management needs are the result of differences in soil characteristics, such as fertility levels, erodibility, organic matter content, availability of water for plant growth, drainage, and the hazard of flooding. Cropping systems and soil tillage are additional important parts of management. Because the soil pattern of a farm is unique, each farm has unique management problems. Some principles of farm management, however, apply to specific soils and certain crops. This section presents the general principles of management that can be applied widely to the soils of Grant Parish.

Perennial grasses or legumes or mixtures of grasses and legumes are grown for pasture and hay. These mixtures generally consist of either a summer or a winter perennial grass and a suitable legume. In addition, many farmers seed small grains or ryegrass in the fall for winter and spring forage. Excess grass in summer is harvested as hay for winter (fig. 3).

Common and improved bermudagrass and Pensacola bahiagrass are the summer perennials most commonly grown. Both of these grasses produce good quality forage. Tall fescue, the main winter perennial grass, grows well only on soils that have a favorable moisture content. All of these grasses respond well to fertilizer, particularly nitrogen.

White clover, crimson clover, vetch, and wild winter peas are the most commonly grown legumes. These legumes respond well to lime, particularly where they are grown on acid soils.

Proper grazing is essential for high quality forage, stand survival, and erosion control. Brush and weed control, applications of fertilizer, liming, and renovation of the pasture are also important.

Figure 3.—Coastal bermudagrass cut for hay on Gallion silt loam.

Additional forage is sometimes obtained by grazing the understory native plants in woodland. The amount of forage volume varies according to the woodland site, the condition of the native forage, and the density of the timber stand. Although most woodland is managed mainly for timber, substantial amounts of forage can be obtained if these areas are properly managed. Stocking rates and grazing periods need to be carefully controlled to achieve optimum forage production and also to maintain an adequate cover of understory plants to prevent erosion.

Fertilization and liming. The amount of fertilizer needed depends upon (1) the crop to be grown, (2) past cropping history, (3) the level of yield desired, and (4) the soil phase. Specific recommendations should be based on laboratory analysis of soil samples.

A soil sample for laboratory testing should consist of a single soil phase and should represent no more than 10 acres. Agricultural agencies in the parish can supply detailed information and instruction regarding soil sampling. In the upper 20 inches, the soils in Grant Parish range in reaction from strongly acid to moderately alkaline. The more acid soils may require lime.

Organic matter content. Organic matter is important as a source of nitrogen for crop growth. In addition, it increases the rate water is taken into the soil, reduces surface crusting and soil loss by erosion, and promotes good physical condition of the surface soil.

Most of the cultivated soils in Grant Parish are low in organic matter content. To a limited extent, organic matter can be built up and maintained by leaving plant residue on the soil, by promoting more plant growth and using plants that have extensive root systems, by adding barnyard manure, and by growing perennial grasses and legumes in rotation with other crops.

Soil tillage. The major purpose of soil tillage is seedbed preparation and weed control. Seedbed preparation, cultivating, and harvesting tend to damage the soil structure. Excessive cultivation of the soils should be avoided. Some of the clayey soils in the parish become cloddy when they are plowed.

A compacted layer develops in the loamy soils if they are plowed at the same depth for long periods or are plowed when wet. The compact layer is generally known as a traffic pan or plowpan, and it develops just below the plow layer. This compacted layer can be avoided by not plowing when the soil is wet, by changing to different depths for plowing, or by subsoiling or chiseling.

Some tillage implements stir the surface and leave the crop residue on the surface for protection from beating rains. The use of such implements helps to control erosion, reduce runoff, and increase infiltration.

Drainage. Many of the soils in the parish need surface drainage. Early drainage methods involved a complex pattern of main ditches, laterals, and field drains. A more recent approach to drainage in Grant Parish combines land leveling and grading with a minimum of open ditches. Such a system creates larger and more uniformly shaped fields that are more suited to the use of modern, multirow farm machinery.

The Red River guide levee system protects most of the cropland and pastureland from flooding; nevertheless, some of the soils at lower elevations are subject to flooding by runoff from higher areas.

Water for plant growth. The available water capacity of the soils in the parish ranges from low to high, but in many years sufficient water is not available at the critical time for optimum plant growth unless irrigation is used. Large amounts of rain fall in winter and spring. Sufficient rain generally falls in summer and autumn of most years; however, during the dry periods in summer and autumn, most of the soils do not supply sufficient water for plants. This rainfall pattern favors the growth of early maturing crops.

Cropping system. A good cropping system includes a legume for nitrogen, a cultivated crop to aid in weed control, a deep-rooted crop to utilize the fertility and maintain the permeability in the subsoil, and a close-growing crop to help maintain the content of organic matter. In a good cropping system the sequence of crops should be such that the soil has a cover during as much of the year as possible.

A suitable cropping system varies according to the needs of the farmer and the characteristics of the soil. Producers of livestock, for example, generally use a cropping system that has a higher percentage of pasture than the cropping system used on cash-crop farms. In many areas of the flood plain, soybeans are grown continuously or in rotation with corn, cotton, or grain sorghum. Grass or legume cover crops are commonly grown during the fall and winter. Double cropping of wheat and soybeans is becoming more common in some places (fig. 4). In other places Irish potatoes, sweet potatoes, or shallots commonly are planted in rotation with soybeans. Additional information on cropping systems can be obtained from the Soil Conservation Service, the Cooperative Extension Service, or the Louisiana Agricultural Experiment Station.

Control of erosion. Soil erosion is a hazard on the terrace uplands in Grant Parish. It is not a serious problem on soils of the alluvial plains, mainly because the topography is level or nearly level. Sheet erosion is moderately severe in all fallow-plowed fields and in newly constructed drainage ditches. Some gully erosion occurs, mainly in areas of the more sloping soils, where sediment enters the drainage ditches. Sheet and gully erosion can be reduced by maintaining a cover of vegetation or plant residue, by farming on the contour or stripcropping, by using minimum tillage, and by controlling weeds using methods other than fallow plowing. New drainage ditches should be seeded immediately after construction. Water control structures to control gully erosion should be placed in areas where water flows into the drainage ditches.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby parishes and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil

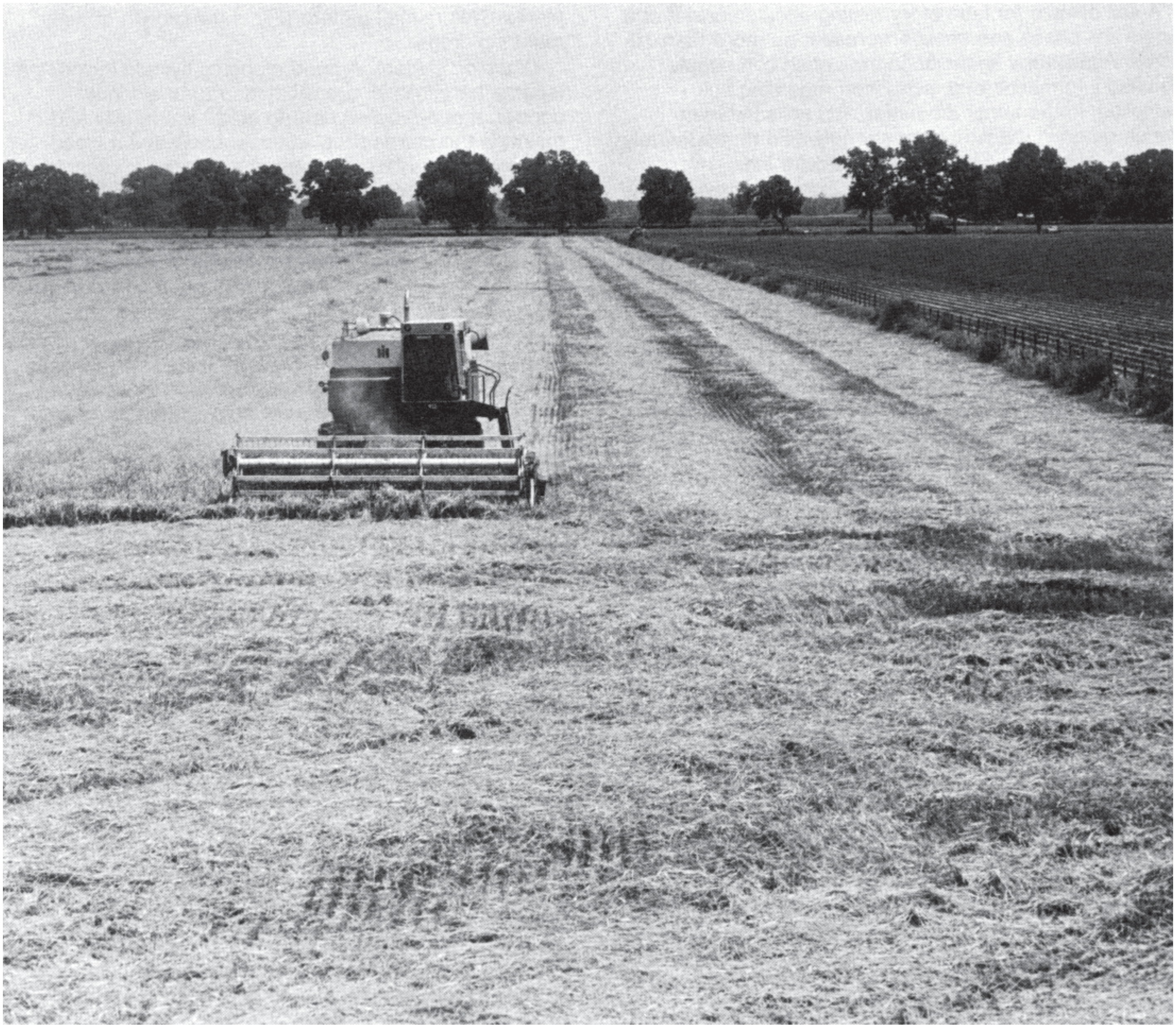

Figure 4.—Wheat harvesting on Roxana very fine sandy loam. This wheat, which was planted in the fall, will be followed by soybeans to be planted in spring and early in summer.

and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

H. Ford Fallin, State staff forester, Soil Conservation Service, prepared this section.

Grant Parish has 356,400 acres of forest. This is 82 percent of the land area. Of this acreage, 85 percent is in the terrace uplands and is dominated by pine trees. The other 15 percent is in the drainageways in the uplands and on the alluvial plain of the Little and Red Rivers. It is dominated by lowland hardwoods.

Loblolly pine, slash pine, longleaf pine, shortleaf pine, white oak, water oak, overcup oak, red oak, sweetgum, hickory, green ash, sycamore, blackgum, beech, magnolia, sweetbay, red maple, winged elm, sugarberry, eastern redcedar, cottonwood, flowering dogwood, persimmon, bitter pecan, black willow, black cherry, baldcypress, tupelo gum, and sassafras are the main species.

Commercial timber is used by eight industries within the parish. One permanent sawmill, a southern pine plywood and veneer mill, and six miscellaneous industrial plants produce wood products, such as bark, pallets, firewood, crossties, boards, and chairs. In addition, there are five pulpwood procurement centers. In 1978, according to the Louisiana Department of Natural Resources Office of Forestry, 35,893,600 board feet (Doyle Scale) of sawtimber and 98,337 standard cords of pulpwood were harvested in Grant Parish.

In 1974, 39.6 percent of the commercial forest land was owned by the national forest and other public interests; 24.1 percent was owned by industry; and 36.3 percent was owned by farmers and other private interests. Of the 3,765 forest landowners in Grant Parish,

89 percent own less than 80 acres and 99 percent own less than 500 acres.

Clear-cutting by prescription is being carried on by the U.S. Forest Service, timber companies, and some nonindustrial timberland owners. Most of the clear cuts are followed by site preparation and tree planting or direct seeding. According to Louisiana Office of Forestry records, 212 plantations were made from 1931 to 1965. These plantations covered 15,011 acres.

Prescribed burning is practiced in many pine stands. This practice helps to reduce excessive fuel, control undesirable vegetation, improve wildlife habitat, and promote forage plant management. Easier site preparation for planting or seeding, better conditions for natural regeneration, and control of brown spot needle disease in longleaf pine are additional benefits of prescribed burning. Timberland owners are encouraged to follow improved harvesting methods so that wood can be produced on a sustained yield basis. Assistance is available from state and federal agency personnel, consulting foresters, and others.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation, *w*, indicates excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil and *s*, sandy texture. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: w, d, c, and s.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table

12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding, should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Billy R. Craft, State staff biologist, Soil Conservation Service, prepared this section.

Many species of wildlife inhabit Grant Parish. The combination of uplands and bottom lands provides habitat for a varied wildlife community. The open agricultural land, mostly on the western boundary of the parish along Red River, provides habitat for wildlife species, such as bobwhite quail, mourning dove, cottontail and swamp rabbits, woodcock, and many nongame animals. In these areas, soybeans or a combination of soybeans and winter wheat are mostly grown. The main restriction for wildlife in the open agricultural areas along the Red River is lack of fall and winter cover due to the large areas of open fields. The Red River and associated habitats serve as a primary migration route for waterfowl and provide resting habitat for migrating waterfowl in fall and spring.

Most of the 356,400 acres of forest is in the uplands. This forested area has low to high populations of wildlife. White-tailed deer, gray and fox squirrels, swamp and cottontail rabbits, wild turkeys, woodcocks, coyotes, foxes, mink, raccoons, opossums, beaver, nutria, mallards, wood ducks, various species of wading birds, reptiles, amphibians, and many other nongame animals frequent these areas. The longleaf pine forest in the central part of the parish provides areas of good habitat for bobwhite quail.

Block clear cutting, which is practiced by some of the timber companies, provides excellent areas of habitat for quail and is also beneficial to white-tailed deer. The almost total loss of mast production from trees, such as oaks and hickories, is the greatest disadvantage of clear-cuts.

The flood plains of the larger creeks and bayous that drain the terrace uplands provide the best habitat for squirrels. Fish Creek, Big Creek, Indian Creek, Bear Creek, Iatt Creek, D'Artigo Bayou, and Flagon Bayou are the most important creeks and bayous. The flood plains of these streams make up about 31,360 acres.

The Catahoula National Wildlife Preserve, which is partly in Grant Parish, comprises about 139,686 acres and is owned and managed by the U.S. Forest Service. This area is managed for multiple use of the resources and has the largest wild turkey population in the parish. At least two endangered species, the redcockaded woodpecker and the American alligator, live in Grant Parish.

A high percentage of privately owned forest land in Grant Parish is open to hunting. In 1978, 210,500 acres of privately owned forest land was available to hunters. Most of the private ponds, lakes, rivers, creeks, and bayous in the parish are stocked with fish, such as largemouth bass, white bass, yellow bass, white and black crappie, bream (sunfish), buffalo, bowfin, gar, carp, shad, and pickerel. Iatt Lake and Nantachie Lake are the largest manmade lakes. Nantachie Lake provides excellent largemouth bass fishing. In addition, most of the 280 farm ponds in Grant Parish have been stocked with largemouth bass, bluegill, and redear sunfish.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in

planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue and clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, paspalum, switchgrass, panicum, and lespedeza.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, sweetgum, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are red mulberry, redbay, and mayhew.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine and cedar.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are American beautyberry, wax myrtle, American elder, and sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadowlarks, field sparrows, cottontails, and red foxes.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkeys, woodcock, thrushes, woodpeckers, squirrels, gray foxes, raccoons, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrats, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water

management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil),

shrink-swell potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or

soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding, slope, and susceptibility to flooding. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*4*) and the system adopted by the American Association of State Highway and Transportation Officials (*3*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 15.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency of flooding. Flooding is divided into two categories, yearly flooding and flooding during the cropping season. Yearly flooding can occur at any time during the year and is used in rating the soils in tables 9, 11, and 12. Flooding during the cropping season occurs during the period from June 1 to November 30. Duration and months are shown only for flooding during the cropping season because ratings are not critical in tables 9, 11, and 12.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. For yearly flooding, *none* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years.

For flooding during the cropping season, *none* means that flooding is not probable during the cropping season; *rare* that it is unlikely, but possible under unusual weather conditions and that it can occur from one to ten times during each 100-year period during the cropping season; *occasional* means that flooding occurs from 11 to 40 times during each 100-year period during the cropping season; and *frequent* that it occurs more frequently than 41 times during each 100-year period during the cropping season. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based, in part, on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Engineering surveys and gage readings are available for some areas. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated

zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 18. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by The Soil Characterization Laboratory of the Louisiana Agricultural Experiment Station.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (*28*).

Sand—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).
Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all materials less than 2 mm (3A1).
Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).
Water retained—pressure extraction, percentage of oven-dry weight of less than 2 mm material; 1/3 or 1/10 (3/10) bar (4B1), 15 bars (4B2).
Moist bulk density—of less than 2 mm material, saran-coated clods (4A1).
Organic carbon—dichromate, ferric sulfate titration (6A1a).
Extractable acidity—barium chloride-triethanolamine I (6H1a).
Cation-exchange capacity—ammonium acetate, pH 7.0 (5A1b).
Base saturation—ammonium acetate, pH 7.0 (5C1).
Reaction (pH)—1:1 water dilution (8C1a).
Reaction (pH)—potassium chloride (8C1c).
Reaction (pH)—calcium chloride (8C1e).
Aluminum—potassium chloride extraction (6G).
Iron—dithionate-citrate extract (6C2b).
Available phosphorus—(Bray No. 1 and No. 2).

The results of chemical (soil fertility) analysis of several typical pedons in the survey area are given in tables 19 and 20. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples in table 19 were analyzed by the Soil Characterization Laboratory of the Louisiana Agricultural Experiment Station. The soil samples in table 20 were analyzed by Soil Fertility Laboratory of the Louisiana Agricultural Experiment Station.

Most determinations were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (*28*).

Organic matter—peroxide digestion (6A3).
Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (6O2), sodium (6P2), potassium (6Q2).
Extractable acidity—barium chloride-triethanolamine I (6H1a).
Cation-exchange capacity—sum of cations (5A3a).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Reaction (pH)—1:1 water dilution (8C1a).
Aluminum—potassium chloride extraction (6G).
Available phosphorus—(Bray's weak extracting solution).

Soil Fertility Levels

Bobby J. Miller, Department of Agronomy, Agricultural Experiment Station, Louisiana State University, prepared this section.

Soil fertility commonly refers to the available plant nutrients in the soil together with other chemical conditions that influence the growth of plants.

The fertility level is one of the major factors that determine the potential of a soil for crop production. The

natural fertility level is the reflection of the inherent capacity of a soil to supply the nutrients required by plants and to provide a favorable chemical environment for the roots of plants. Plant nutrient deficiencies as well as excessive quantities of some elements may limit the yields of crops grown on some of the soils in Grant Parish.

In evaluating the fertility of a soil, the quantities of available plant nutrient elements are considered. The elements can be determined by either a soil test or plant tissue analyses, or both. Also considered are chemical characteristics of the soil that might have a detrimental effect on plant growth. During the survey, samples were collected from each horizon to a depth of at least 40 inches at representative sites of the soils mapped. The samples were analyzed to determine the organic matter content, soil reaction (pH), extractable phosphorus (P), cation exchange capacity and exchangeable calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), aluminum (A1), and hydrogen (H). The results from these analyses, which are given in table 20, are the basis for the discussion in this section. These results can be especially useful in evaluating the effects of such management practices as ditching, terracing, land leveling, and level construction, in which material from the subsurface horizons is incorporated into the surface layer.

Soil fertility management and other soil management programs in this area are generally based on chemical and physical alteration of the surface horizon or plow layer. Characteristics of the surface horizon may be extremely variable from one place to another, depending on past management practices and soil use. In this section, however, emphasis will be placed on characteristics of the horizons below the plow layer.

The subsurface horizons are less subject to change, or change very slowly, as a result of alteration of the plow layer. Fertility levels and other chemical characteristics of the surface horizon can be largely eliminated as limiting factors in plant growth if management systems include adequate soil testing and fertility maintenance programs. Providing normal crop management practices have been observed, the physical characteristics of the plow layer and the physical and chemical characteristics of the lower horizons are the soil factors that may limit plant growth and crop yields. The actual quantity of a nutrient element present and the relative quantity of other elements present are important considerations in evaluating the fertility of a soil. The cation exchange capacity is a measure of the ability of a soil to adsorb positively charged ions, such as Ca, Mg, K, Na, A1, H, and others. Larger quantities of an element, such as calcium (Ca), are required to give a high exchangeable Ca saturation in a soil horizon that has a high cation exchange capacity than a soil horizon that has a low cation exchange capacity. Louisiana Agricultural Experiment Station publications (*7, 18, 19, 21*) contain additional information about these factors as well as the guidelines (*21*) used for various nutrient levels in this discussion.

The cation exchange capacity is almost entirely the result of the amount and kind of clay and organic matter present in a soil. For example, Moreland soil, which has large amounts of clay throughout, has a high cation exchange capacity in all horizons. In contrast, the Cascilla and Roxana soils, which have relatively small amounts of clay, have much lower cation exchange capacities. Many of the soils mapped in Grant Parish have more clay in the subsoil horizons than in the surface horizons. As a result, these soils frequently have a greater cation exchange capacity in the subsoil than in the surface horizon. The cation exchange capacity in the Rigolette soil, for example, is 9.8 milliequivalents per 100 grams of soil in the surface layer and 41.0 milliequivalents per 100 grams of soil in some of the deeper horizons. Organic matter in soils typically has a high cation exchange capacity. Many of the soils have higher cation exchange capacities in the surface horizon than in the next lower horizon even though clay content of the two horizons may be similar. Rigolette, Kolin, Kisatchie, Smithdale, Glenmora, Cascilla, Caddo, and Guyton soils are examples. This difference is largely due to a higher organic matter content in the surface layer than in the next lower horizon.

Soils that developed in recent Red River alluvium, such as Armistead, Roxana, Latanier, Moreland, Norwood, and Gallion soils, are characterized by high or medium natural fertility levels in the subsurface horizons. In the soils analyzed, pH values are more than 6.0 and base saturations are above 65 percent. In these soils Ca is the predominant exchangeable cation.

Low natural fertility levels are characteristic of soils developed in parent material other than recent Red River alluvium. The distribution pattern of the different essential plant nutrient elements in these other soils, as shown in table 20, indicates that the weathering of minerals, decomposition of organic matter, and other natural sources of nutrient elements do not maintain high P, Ca, Mg, and K levels in the surface layer and in the upper horizon of the subsoil. Many of the soils have higher nutrient levels in the surface layer than in the next lower horizon because of the addition of lime and fertilizer or because nutrients accumulated in organic matter have been released through decomposition. In most of the soils, these processes have not maintained higher levels of Mg in the surface layer than in the subsoil horizons. A soil that has a cation exchange complex that is 85 to 100 percent saturated with bases (Ca, Mg, K, Na) is the most desirable condition for most agricultural purposes. Except for those soils in the Red River alluvial plain, however, very few soils in Grant Parish have base saturations so high as this in any horizon. The relative amounts of the bases present are also important. In general, 60 to 80 percent saturation

with calcium, 10 to 20 percent saturation with magnesium, 2 to 5 percent saturation with potassium, and less than 2 percent saturation with sodium are considered favorable for most uses. Excessive quantities of a particular element, especially Na, can be detrimental.

Among the soils analyzed in Grant Parish, there are three general groups for levels of extractable phosphorus (P) in horizons below the surface. Roxana, Armistead, Latanier, Moreland, and Norwood soils have the largest amount of extractable P in the subsurface horizons. Extractable P levels in subsurface horizons in these soils range from 66 to 233 parts per million and exceed 100 parts per million in most. Gallion soil has somewhat lower levels of extractable P in the subsurface horizons, and only the lowest horizon at a depth of 49 to 65 inches contained as much as 100 parts per million extractable P. All of the other soils contained less than 10 parts per million extractable P in the subsurface horizons.

In the soils analyzed, large amounts of exchangeable sodium (Na) were present in the lower part of the solum in the Glenmore, Caddo, and Guyton soils. However, high levels of exchangeable Na may be absent in some areas of these soils in Grant Parish. Problems resulting from high levels of exchangeable Na are most pronounced during dry years and in deep rooting perennial or summer growing annual plants; however, high levels of Na in these soils are typically at too great a depth to have a major influence on the growth of plants in most years.

Three important characteristics of the soils that have high levels of exchangeable Na are indicated by the data in table 20. (1) High levels of Na are almost entirely in the subsoil horizons. (2) In all of the soils that contain large quantities of Na, amounts remain large or increase throughout below the depths at which the high Na levels are encountered. This indicates a potential for detrimental effects if the subsoil material is incorporated into the surface layer, as in land smoothing or in spreading spoil (soil material taken from excavations for use as building foundations, roadways, drainage ditches, and other works). (3) A neutral or alkaline soil reaction is not reliable as an indicator of exchangeable Na. Some soils, for example, Guyton soils, have high levels of exchangeable Na in horizons that have an acid reaction. Other soils, such as Roxana soils, may have pH values of more than 8.0 in horizons that do not have high Na levels. In some areas, particularly in arid regions, large quantities of exchangeable Na are typically associated with alkaline soil reactions. In Grant Parish, soils that have high Na levels in the subsoil may have pH values of less than 5.0. These soils may have a neutral or alkaline reaction, however, at depths in or below the solum.

High levels of exchangeable Na are somewhat unusual in soils that developed in old parent material in a humid subtropical climate such as that of Grant Parish. The source of the Na in these soils has not been established. Neither have satisfactory economical methods been devised for lowering the levels of Na in these soils.

Quantities of exchangeable aluminum (A1) that are potentially toxic to some plants occur in horizons of many mineral soils having pH values of less than about 5.5. High levels of exchangeable aluminum (A1) can be toxic to many cultivars of crops, for example, cotton, soybeans, corn, and small grains (*1, 2, 11, 15, 17*). A more than 10 percent saturation of the effective cation exchange capacity of a soil with exchangeable A1 may result in A1 toxicity to some crops. The effective cation exchange capacity of the soil is the sum of the exchangeable Ca, Mg, K, Na, A1, and H. Potentially toxic levels of exchangeable A1 were present in the surface layer as well as in the subsurface horizons of a number of soils analyzed. Only the Roxana, Armistead, Latanier, Moreland, Norwood, and Gallion soils had less than 10 percent saturation with exchangeable A1 in all horizons. Rigolette, Kolin, Kisatchie, Cahaba, Smithdale, Glenmora, Mayhew, Cascilla, and Caddo soils all had A1 saturation of 40 percent or more in the subsurface horizons at depths of less than 24 inches.

The quantities of exchangeable aluminum (A1) and the percent saturation and other selected chemical properties of selected soils in Grant Parish are given in table 20. Important relationships exist between saturation with exchangeable A1 and other properties of mineral soils. (1) Exchangeable A1 rather than H is the dominant form of exchangeable acidity in most subsurface horizons where exchangeable A1 is present. Total exchangeable acidity for any horizon can be obtained by adding exchangeable A1 and H. (2) Potentially toxic levels of exchangeable A1 are typically present in soil horizons that have pH 5.0 or less and in some soil horizons that have pH 5.1 to 5.5. (3) The percent saturation with exchangeable A1 generally decreases as the organic matter content increases. Therefore, surface layers that have exchangeable A1 are commonly less saturated than subsoil horizons having comparable pH values. Exceptions are the Cascilla, Guyton, and Smithdale soils. The amounts of exchangeable A1 typically increase as the clay content increases in horizons that have comparable soil reactions, and the percent saturation increases as the soil becomes more acid than about pH 5.5. Consequently, the greatest saturation with exchangeable A1 is generally in the most clayey and most acid subsoil horizons that have decreasing saturation at greater depths. The kinds of clay minerals in the soil also influence the quantities of exchangeable A1 present.

The complex relationships between exchangeable A1 and other soil properties indicate that actual measurement of exchangeable A1 present in the soil is the only reliable indicator of A1 levels in acid mineral

soils having pH 5.5 or less (*18, 19*). Potentially toxic levels of exchangeable A1 have not been found in soils having high pH values.

Soil treatments or other cultural methods that reduce or avoid problems associated with high levels of exchangeable A1 have not been thoroughly studied in Louisiana. Liming soil horizons to above 5.5 is probably the most widespread method of reducing exchangeable A1 levels (*5, 6, 8, 12, 14, 20, 22, 23, 24*). There is a wide range of susceptibility to A1 phytotoxicity among many agronomic crops, depending on the particular cultivar grown. Planting crops or cultivars that are tolerant of high A1 levels helps to avoid phytotoxicity problems.

Manganese (Mn) is an essential plant nutrient element that may be present in amounts that are toxic to plants in many acid, poorly drained soils. Mn is somewhat analogous to A1 in that potentially toxic levels are most common in soil horizons that have a pH 5.0 to 5.5 or less. Increasing the pH of the soil to pH 6.0 or more reduces Mn solubility to nontoxic levels. Unlike A1, however, Mn can occur either as the oxidized or reduced form in soils. The more soluble reduced form of Mn is more prevalent in wet, poorly drained or somewhat poorly drained soils than in associated soils that are better drained. In addition, potentially toxic levels in surface horizons are more common for Mn than A1. Toxicity caused by high levels of Mn is more common in wet years than in dry years.

Soils that developed in recent Red River alluvium, such as Armistead, Roxana, Latanier, Moreland, Norwood, and Gallion soils, have free calcium carbonate in some or all horizons. The presence of calcium carbonate is an important factor in use and management of soils. It is a very readily weatherable source of Calcium and a neutralizer of acidity.

Large quantities of calcium carbonate in the upper horizons and especially in the surface horizons may be undesirable for plant growth for several reasons. (1) The alkaline soil reaction maintained by excess calcium carbonate can seriously limit availability to plants of the most essential plant nutrients, especially micronutrients such as zinc, copper, and manganese. (2) Large quantities of phosphorus may be precipitated as compounds, such as tricalcium phosphates. (3) Excessive amounts of calcium carbonate may, upon weathering, cause unfavorable cation exchange reactions. The exchange complex of the soil may become essentially 100 percent Ca saturated and almost devoid of other cations, such as Mg and K.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*29*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 21 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fluvaquents (*Fluv*, meaning flood plain horizonation, plus *aquent*, the suborder of the Entisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*27*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*29*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Armistead Series

The Armistead series consists of somewhat poorly drained, slowly permeable soils that formed in clayey and loamy alluvium. These soils are on the natural levees of former channels and distributaries of the Red River. Slopes are less than 1 percent.

Soils of the Armistead series are fine-silty, mixed, thermic Aquic Argiudolls.

Armistead soils are similar to and commonly are near Latanier soils. They are also near Gallion and Moreland soils. The well drained Gallion soils are in slightly higher positions on natural levees and are loamy throughout.

The somewhat poorly drained Latanier soils are in slightly higher positions and do not have an argillic horizon. The somewhat poorly drained Moreland soils are in positions similar to those of the Armistead soils and are clayey throughout.

Typical pedon of Armistead clay, 3 miles southeast of Colfax, 2 miles east of Highway 8, 1.3 miles north of Highway 492, 270 feet south of gate, 150 feet west of fence, center of sec. 50, T. 6 N., R. 3 W.

Ap—0 to 5 inches; dark brown (7.5YR 3/2) clay; common fine faint yellowish red mottles; weak medium subangular blocky structure; firm; few medium and fine roots; common fine reddish brown stains; slightly acid; clear smooth boundary.

A1—5 to 14 inches; dark reddish brown (5YR 3/3) silty clay; moderate coarse subangular blocky structure; firm; few fine roots; few soft black bodies; neutral; clear smooth boundary.

IIA—14 to 23 inches; dark brown (7.5YR 3/2) silt loam; few fine faint very dark gray mottles; weak medium subangular blocky structure; firm; few medium and fine roots; many medium discontinuous irregular impeded pores; few small spots of yellowish red silt loam; neutral; clear smooth boundary.

IIB21t—23 to 35 inches; reddish brown (5YR 4/4) silty clay loam; common fine faint yellowish red mottles; moderate medium subangular blocky structure; firm; many medium discontinuous irregular impeded pores; common discontinuous thick distinct clay films on surfaces of some peds; very dark gray (5YR 3/1) stains in some root channels and pores; mildly alkaline; clear wavy boundary.

IIB22t—35 to 52 inches; yellowish red (5YR 4/6) silt loam; weak fine subangular blocky structure; friable; few thin patchy faint clay films on surfaces of some peds; mildly alkaline; clear wavy boundary.

IIC—52 to 75 inches; yellowish red (5YR 5/6) silt loam; massive; friable; moderately alkaline.

The thickness of the solum ranges from 40 to 65 inches.

Typically, the A horizon has hue of 2.5YR or 7.5YR, value of 3, and chroma of 2. Some pedons have hue of 5YR, value of 3, and chroma of 2 or 3. The thickness of the A horizon ranges from 10 to 20 inches. Reaction ranges from slightly acid to moderately alkaline. Typically, the surface layer is clay; however, the range includes silty clay.

Typically, the IIA horizon has hue of 2.5YR or 7.5YR, value of 3, and chroma of 2. Some pedons have hue of 5YR, value of 3, and chroma of 2 or 3. Reaction ranges from neutral to moderately alkaline. Texture is silty clay loam or silt loam.

The IIBt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. Reaction ranges from slightly acid to moderately alkaline. Texture is silty clay loam or silt loam.

The IIC horizon is similar in color and reaction to the IIBt horizon. It is silty clay loam, silt loam, loam, or very fine sandy loam.

Briley Series

The Briley series consists of well drained, moderately permeable soils that formed in sandy and loamy sediment. These soils are on convex ridgetops and side slopes in the terrace uplands. Slopes range from 5 to 12 percent.

Soils of the Briley series are loamy, siliceous, thermic Arenic Paleudults.

Briley soils commonly are near Ruston and Smithdale soils. The Ruston soils are on ridgetops, and the Smithdale soils are on side slopes. Both Ruston and Smithdale soils are loamy throughout.

Typical pedon of Briley loamy fine sand, 5 to 12 percent slopes, 4.5 miles northeast of Williana, 100 feet west of U.S. Forest Service Road 131, SW1/4SE1/4 sec. 4, T. 8 N., R. 1 W.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; very friable; common fine roots; medium acid; clear smooth boundary.

A21—7 to 15 inches; light yellowish brown (10YR 6/4) loamy fine sand; structureless; loose; common fine roots; medium acid; clear wavy boundary.

A22—15 to 30 inches; light yellowish brown (10YR 6/4) loamy fine sand; structureless; loose; common fine roots; common yellowish brown (10YR 5/4) stains; strongly acid; clear smooth boundary.

B21t—30 to 41 inches; yellowish red (5YR 5/6) sandy clay loam; few fine distinct yellowish brown mottles; moderate medium subangular blocky structure; friable; few fine roots; few discontinuous distinct thick clay films on vertical faces of peds; very strongly acid; clear wavy boundary.

B22t—41 to 65 inches; yellowish red (5YR 5/6) fine sandy loam; few fine distinct strong brown mottles; weak medium subangular blocky structure; friable; few patchy faint thin clay films on faces of some peds; very strongly acid.

The solum is more than 65 inches thick. Reaction ranges from slightly acid to strongly acid in the A1 and A2 horizons and from medium acid to very strongly acid in the B horizon.

The A1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. It is 4 to 10 inches thick.

The A2 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is 14 to 28 inches thick.

The B2t horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 to 8. It is fine sandy loam or sandy clay loam.

Caddo Series

The Caddo series consists of poorly drained, slowly permeable soils that formed in loamy sediment. These soils are on broad flats in the terrace uplands. Slopes are less than 1 percent.

Soils of the Caddo series are fine-silty, siliceous, thermic Typic Glossaqualfs.

Caddo soils commonly are near Glenmora and Guyton soils. Glenmora soils are in higher positions and are not so gray as Caddo soils. The Guyton soils are in lower positions and do not have red mottles in the subsoil.

Typical pedon of Caddo silt loam, 5.2 miles southeast of New Verda, 5.2 miles southeast of the intersection of Highways 471 and 122, 4,100 feet north of Highway 122, 100 feet west of private road, NE1/4SE1/4, sec. 16, T. 8 N., R. 3 W.

A1—0 to 4 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; friable; many fine and many medium roots; few medium black concretions; very strongly acid; abrupt irregular boundary.

A21g—4 to 11 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine and medium roots; common fine discontinuous random tubular impeded pores; strongly acid; gradual smooth boundary.

A22g—11 to 21 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; common fine roots; common medium discontinuous random tubular impeded pores; light gray (10YR 7/1) ped coats on vertical faces of peds; strongly acid; abrupt irregular boundary.

B&A—21 to 35 inches; light brownish gray (10YR 6/2) silty clay loam (B2t); many medium distinct yellowish brown (10YR 5/6) and few fine prominent red mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; firm; few medium roots; few medium discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on vertical faces of peds; light gray (10YR 7/1) silt loam (A2) tongues 2 to 10 centimeters wide extend to 30 inches and make up 20 percent of the horizon; about 4 percent plinthite; strongly acid; clear irregular boundary.

B22tg—35 to 61 inches; light brownish gray (10YR 6/2) silty clay loam; few medium distinct yellowish brown (10YR 5/6) mottles; many medium prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm; common discontinuous distinct thick clay films on vertical faces of peds; strongly acid; clear wavy boundary.

B3g—61 to 80 inches; gray (10YR 6/1) silty clay loam; few medium distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; very strongly acid.

The solum ranges from 60 to 100 inches in thickness. Reaction ranges from very strongly acid to medium acid throughout. The effective cation exchange capacity of this soil is 50 percent or more saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 horizon has hue of 10YR, value of 5, and chroma of 2, or value of 4 and chroma of 1 or 2. It is 2 to 6 inches thick.

The A2g horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2, or it has hue of 2.5Y, value of 5, and chroma of 2. Mottles in shades of brown and yellow range from few to common. The A2g horizon is very fine sandy loam or silt loam. It is 12 to 30 inches thick.

The Btg horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2, or it has hue of 2.5Y, value of 5, and chroma of 2. It is mottled in shades of yellow, brown, and red. It is silt loam, loam, or silty clay loam.

The B3g horizon is similar in color and texture to that of the Btg horizon.

Some pedons have a Cg horizon. Where present, it is similar in color and texture to that of the B2tg and B3g horizons.

Cadeville Series

The Cadeville series consists of moderately well drained, very slowly permeable soils that formed in clayey sediment. These soils are on side slopes and ridgetops in the terrace uplands. Slopes range from 2 to 12 percent.

Soils of the Cadeville series are fine, mixed, thermic Albaquic Hapludalfs.

Cadeville soils are similar to Gore soils and commonly are near Briley, Kisatchie, Malbis, Mayhew, Metcalf, Rigolette, and Smithdale soils. The Briley soils are on ridgetops and have sandy surface and subsurface layers. The Gore soils are in lower positions and have underlying material of yellowish red clay. The Kisatchie soils are in positions similar to those of the Cadeville soils and are underlain by siltstone or sandstone at a depth of 20 to 40 inches. The Mayhew soils are on broad flats and are gray throughout. The Metcalf soils are on broad interstream divides at a higher elevation and have a loamy argillic horizon over a clayey argillic horizon. The Rigolette soils are on concave side slopes and are fine-loamy. The Malbis and Smithdale soils are on upper side slopes at a higher elevation and are loamy throughout.

Typical pedon of Cadeville very fine sandy loam, 2 to 5 percent slopes, 7.25 miles north-northeast of Williana, 2,048 feet north of intersection of U.S. Forest Service Roads 521 and 613, 20 feet east of U.S. Forest Service Road 521, NW1/4SW1/4, sec. 11, T. 9 N., R. 2 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) very fine sandy loam; weak fine granular structure; friable; many fine and medium roots; few coarse roots; extremely acid; clear smooth boundary.

A2—3 to 6 inches; brown (10YR 5/3) very fine sandy loam; weak medium subangular blocky structure parting to weak fine subangular blocky; friable; common fine roots; many medium and many fine discontinuous random tubular impeded pores; common fine soft brown concretions; few thin light gray (10YR 7/1) coats on peds; very strongly acid; abrupt smooth boundary.

B21t—6 to 17 inches; yellowish red (5YR 5/6) clay; common medium faint yellowish red (5YR 4/6) mottles; common fine distinct red (2.5YR 4/8) mottles; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine and few medium roots; few medium discontinuous random tubular impeded pores; extremely acid; clear smooth boundary.

B22t—17 to 32 inches; red (2.5YR 4/6) clay; many medium and coarse prominent light brownish gray (10YR 6/2) mottles; few fine distinct yellowish brown mottles; moderate medium angular blocky structure parting to moderate fine angular blocky; firm; very plastic, very sticky; few fine and coarse roots; shiny grooved surfaces on some peds; extremely acid; gradual wavy boundary.

B23t—32 to 41 inches; light brownish gray (2.5Y 6/2) clay; common medium and fine prominent red (2.5YR 4/6) mottles; moderate fine angular blocky structure; firm; very plastic and very sticky; common fine roots and few medium roots; few dark yellowish brown (10YR 4/6) oxidation stains in abandoned root channels; few fine soft black bodies; shiny grooved faces on surfaces of some peds; few patchy faint thin clay films on surfaces of some peds; extremely acid; gradual wavy boundary.

B24t—41 to 48 inches; light brownish gray (2.5Y 6/2) clay; few medium prominent red (2.5YR 4/6) mottles; few fine distinct yellowish brown mottles; moderate medium subangular blocky structure; firm; very sticky and very plastic; few patchy faint thin clay films on surfaces of some peds; extremely acid; clear smooth boundary.

C—48 to 65 inches; stratified light brownish gray (2.5Y 6/2) clay and yellowish brown (10YR 5/8) very fine sandy loam; massive with common bedding planes; common thin light gray (10YR 7/1) silt lenses around light brownish gray (2.5Y 6/2) silty clay material; few fine barite crystals in silty clay material; extremely acid.

The thickness of the solum ranges from 30 to 60 inches.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is 2 to 5 inches thick and ranges from extremely acid to medium acid. In the control section, to a depth of 30 inches or more, the effective cation exchange capacity of this soil is 20 to 50 percent saturated with exchangeable aluminum.

The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is silt loam, loam, or very fine sandy loam and ranges from 0 to 8 inches thick.

The upper part of the B2 horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4 to 8. The lower part has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2. The B2t horizon is clay or silty clay and ranges from extremely acid to strongly acid.

The C horizon is stratified clay, silty clay, and very fine sandy loam in shades of gray and brown. It is extremely acid to strongly acid.

Cahaba Series

The Cahaba series consists of well drained, moderately permeable soils that formed in loamy and sandy sediment. These soils are on low stream terraces. Slopes range from 1 to 3 percent.

Soils of the Cahaba series are fine-loamy, siliceous, thermic Typic Hapludults.

Cahaba soils are similar to Ruston and Smithdale soils and commonly are near Cascilla and Guyton soils. The Cascilla soils are in lower positions than Cahaba soils and have less sand throughout. The poorly drained Guyton soils are in lower lying, depressional areas and are grayer throughout. The Ruston and Smithdale soils are on side slopes in the terrace uplands and have a thicker solum.

Typical pedon of Cahaba fine sandy loam, 1 to 3 percent slopes, 4.5 miles southeast of New Verda, 4.1 miles southeast of the intersection of Highways 471 and 122, 1.3 miles south of Highway 122, 50 feet east of gravel road, SW1/4NW1/4 sec. 29, T. 8 N., R. 3 W.

A1—0 to 4 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; many medium roots; very strongly acid; clear smooth boundary.

A&B—4 to 8 inches; about 60 percent dark brown (10YR 4/3) fine sandy loam (A2); 40 percent yellowish red (5YR 5/6) sandy clay loam (B2t); weak fine granular structure; friable; few fine roots; few fine discontinuous random tubular impeded pores; strongly acid; clear smooth boundary.

B21t—8 to 18 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; few fine and medium roots; common fine discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on vertical faces of peds; strongly acid; gradual wavy boundary.

B22t—18 to 40 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; firm; common fine discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on vertical faces of peds; strongly acid; gradual wavy boundary.

B3—40 to 48 inches; yellowish red (5YR 5/6) sandy loam; weak fine subangular blocky structure; friable; few patchy faint thin clay films on vertical faces of some peds; few sand pockets; few light yellowish brown (10YR 6/4) stains; strongly acid; gradual wavy boundary.

C—48 to 65 inches; strong brown (7.5YR 5/6) loamy sand; structureless; loose; light yellowish brown (10YR 6/4) and pale brown (10YR 6/3) pockets of sand; strongly acid.

The solum ranges from 36 to 60 inches in thickness. Reaction ranges from very strongly acid to medium acid throughout. The effective cation exchange capacity of this soil is 20 to 50 percent saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 or Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is 4 to 8 inches thick and is sandy loam or fine sandy loam.

The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is fine sandy loam, sandy loam, or loamy fine sand.

The Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 to 8. It is sandy clay loam, loam, or clay loam. Clay content averages about 25 percent in the control section. Silt content ranges from 20 to 50 percent.

The B3 horizon, where present, has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 to 8. In some pedons, the B3 horizon is mottled in shades of yellow and brown. This horizon is fine sandy loam or sandy loam.

The C horizon has hue ranging from 2.5YR to 10YR, value of 4 or 5, and chroma of 4 to 8. It is commonly stratified sand, loamy sand, and fine sandy loam.

Cascilla Series

The Cascilla series consists of well drained, moderately permeable soils that formed in loamy alluvium. These soils are frequently flooded. They are on natural levees of narrow streams that drain the uplands. Slopes are less than 1 percent.

Soils of the Cascilla series are fine-silty, mixed, thermic Fluventic Dystrochrepts.

Cascilla soils commonly are near Caddo, Cahaba, and Guyton soils. The poorly drained Caddo soils are in higher positions on the adjacent terrace uplands. Cahaba soils are in higher positions and are fine-loamy. Guyton soils are on broad flats at a higher elevation and in depressions and flood plains along drainageways. The Guyton soils are grayer throughout than Cascilla soils and have an argillic horizon.

Typical pedon of Cascilla silt loam, in an area of Guyton and Cascilla soils, frequently flooded, 3 miles south of Bentley, 1,420 feet east of Highway 167, 20 feet south of parish road, SE1/4NE1/4 sec. 29, T. 6 N., R. 1 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; few fine roots; very friable; very strongly acid; clear wavy boundary.

B1—8 to 14 inches; dark brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; very friable; few fine roots; few worm casts; very strongly acid; clear wavy boundary.

B21—14 to 25 inches; yellowish brown (10YR 5/4) silt loam; common medium faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; very friable; few fine roots; few fine discontinuous random tubular impeded pores; few patchy faint thin clay films on faces of some peds; few worm casts; very strongly acid; clear wavy boundary.

B22—25 to 42 inches; yellowish brown (10YR 5/4) silt loam; common fine faint brown mottles; weak medium subangular blocky structure; friable; few fine discontinuous random tubular impeded pores; few patchy faint thin clay films on faces of some peds; very strongly acid; clear wavy boundary.

B3—42 to 60 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; friable; very strongly acid; clear wavy boundary.

IIC—60 to 80 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; very friable; very strongly acid.

The solum ranges from 45 to 80 inches in thickness. The soil is very strongly acid or strongly acid throughout, except for the surface soil where it has been limed. The effective cation exchange capacity of this soil is 50 percent or more saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is 5 to 10 inches thick. Some pedons have a thin A1 horizon that has hue of 10YR, value of 3, and chroma of 1 or 2.

The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Some pedons have mottles in shades of gray below a depth of 24 inches.

The B3 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. Most pedons have mottles in shades of gray.

The IIC horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. It is fine sandy loam or loam.

Gallion Series

The Gallion series consists of well drained, moderately permeable soils that formed in loamy alluvium. These soils are on natural levees of former channels of the Red River and its distributaries. Slopes are less than 1 percent.

Soils of the Gallion series are fine-silty, mixed, thermic Typic Hapludalfs.

Gallion soils are similar to Norwood soils and commonly are near Armistead, Latanier, Moreland, and Roxana soils. The Armistead and Latanier soils are in slightly lower positions and have more clay in the upper part of the profile. The Moreland soils are in lower positons and are more clayey throughout. The Norwood soils are on natural levees of the present channel and distributaries of the Red River and do not have an argillic horizon. The Roxana soils are in positions similar to that of Gallion soils. They do not have an argillic horizon and are coarse-silty.

Typical pedon of Gallion silt loam, about 3 miles south of Bagdad, 150 feet east of Bayou Marteau, 25 feet north of parish road, sec. 8, T. 5 N., R. 2 W.

Ap—0 to 8 inches; brown (7.5YR 4/4) silt loam; weak fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

B21t—8 to 19 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine and medium roots; common fine discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on vertical faces of peds; slightly acid; gradual smooth boundary.

B22t—19 to 34 inches; yellowish red (5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on vertical faces of peds; slightly acid; clear smooth boundary.

B3—34 to 49 inches; yellowish red (5YR 5/6) very fine sandy loam; weak medium subangular blocky structure; very friable; few patchy faint thin clay films on vertical faces of some peds; slightly acid; gradual smooth boundary.

C—49 to 65 inches; yellowish red (5YR 5/6) very fine sandy loam; massive; very friable; neutral.

The thickness of the solum ranges from 40 to 60 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3; or it has hue of 7.5YR, value of 4 or 5, and chroma of 2 to 4. The A horizon is 4 to 12 inches thick and is medium acid to neutral. It is silt loam or silty clay loam.

The B2t horizon has hue of 5YR, value of 3 to 5, and chroma of 3 to 6; or it has hue of 7.5YR, value of 4 or 5, and chroma of 4. The B2t horizon ranges from medium acid to mildly alkaline. It is silt loam, clay loam, or silty clay loam.

The B3 horizon has a color range similar to that of the B2t horizon. It ranges from slightly acid to moderately alkaline and is very fine sandy loam, silt loam, loam, clay loam, or silty clay loam. Some pedons have carbonates.

The C horizon is similar in color, reaction, and texture to the B3 horizon. Some pedons have common bedding planes.

Glenmora Series

The Glenmora series consists of moderately well drained, slowly permeable soils that formed in loamy sediment. These soils are in terrace uplands. Slopes range from 1 to 3 percent.

Soils of the Glenmora series are fine-silty, siliceous, thermic Glossaquic Paleudalfs.

Glenmora soils commonly are near Caddo, Cadeville, and Guyton soils. They are in positions similar to those of Kolin soils. The Caddo and Guyton soils are in depressional areas and on broad level flats and are grayer throughout. Cadeville soils are on lower side slopes and have a more clayey subsoil than Glenmora soils. Kolin soils are in positions similar to those of Glenmora soils and have more clay in the lower part of the subsoil.

Typical pedon of Glenmora silt loam, 1 to 3 percent slopes, 2.1 miles southeast of Bentley, 280 feet north of U.S. Forest Service Road 144, 15 feet west of logging road, NW1/4NE1/4 sec. 21, T. 6 N., R. 1 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; common medium roots and many fine roots; strongly acid; clear smooth boundary.

A2—5 to 9 inches; brown (10YR 5/3) silt loam; few medium faint dark grayish brown (10YR 4/2) mottles; weak fine subangular blocky structure; friable; common medium roots; medium acid; clear smooth boundary.

B1—9 to 15 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; common medium roots; few fine discontinuous random irregular impeded pores; medium acid; clear wavy boundary.

B21t—15 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; common medium prominent red (2.5YR 4/8) and few fine distinct light brownish gray mottles; moderate medium subangular blocky structure; firm; common medium roots; few fine discontinuous random irregular impeded pores; common medium soft red (2.5YR 4/8) concretions; common discontinuous distinct thick clay films on faces of peds; medium acid; clear wavy boundary.

B&A'2—30 to 38 inches; light brownish gray (10YR 6/2) silty clay loam; interior of peds is strong brown

(7.5YR 5/6) silty clay loam (B2t); light brownish gray (10YR 6/2) silt (A'2) on exterior of peds makes up 15 percent of horizon; many medium prominent red (2.5YR 4/8) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine discontinuous random irregular impeded pores; common discontinuous distinct thick clay films on faces of some peds; medium acid; clear wavy boundary.

B22t—38 to 54 inches; gray (10YR 6/1) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) and few fine prominent red mottles; moderate medium subangular blocky structure; firm; common discontinuous distinct thick clay films on faces of peds; medium acid; clear smooth boundary.

B23t—54 to 69 inches; mottled yellowish brown (10YR 5/6) and gray (10YR 6/1) silty clay loam; few fine prominent red mottles; weak medium subangular blocky structure; firm; few discontinuous distinct thick clay films on faces of peds; medium acid; clear wavy boundary.

C—69 to 80 inches; yellowish red (5YR 5/6) silty clay; common medium distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; massive; firm; medium acid.

The thickness of the solum ranges from 60 to 100 inches. The soil ranges from very strongly acid to medium acid throughout the profile. The effective cation exchange capacity of this soil is 50 percent or more saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is 4 to 7 inches thick.

The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It is silt loam or very fine sandy loam and typically is 3 to 6 inches thick. Some pedons do not have an A2 horizon.

The B1 and B21t horizons have hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 6. Mottles in shades of gray, brown, and red range from few to common. These horizons are silt loam or silty clay loam.

The A'2 part of the B & A'2 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It makes up 5 to 15 percent of the horizon, in the form of pockets or coatings on ped faces. The B2t part of the horizon is similar in color to that of the B1 and B21t horizons.

The B22t and B23t horizons are mottled in shades of gray, brown, and red. They have hue of 10YR, 7.5YR or 5YR, value of 4 to 6, and chroma of 1 to 8.

The C horizon ranges in color from gray to yellowish red. It is silty clay loam or silty clay.

Gore Series

The Gore series consists of moderately well drained, very slowly permeable soils that formed in clayey sediment. These soils are in terrace uplands. Slopes range from 1 to 12 percent.

Soils of the Gore series are fine, mixed, thermic Vertic Paleudalfs.

Gore soils commonly are near Guyton and Kolin soils and are similar to Cadeville soils. The Guyton soils are on flood plains of small streams and are fine-silty. Kolin soils are in slightly higher positions and are fine-silty. Cadeville soils are in higher positions on a different landscape. They are grayer throughout than Gore soils and have montmorillonitic clay mineralogy.

Typical pedon of Gore silt loam, 1 to 5 percent slopes, 2.75 miles southeast of Montgomery, 0.4 mile southwest of Highway 71, 210 feet southeast of logging road, NW1/4NW1/4 sec. 35, T. 8 N., R. 5 W.

A1—0 to 4 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; few coarse roots and common fine roots; medium acid; clear wavy boundary.

A2—4 to 7 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; common fine roots; few fine discontinuous random tubular impeded pores; strongly acid; clear wavy boundary.

B1—7 to 10 inches; strong brown (7.5YR 5/6) silty clay loam; few medium distinct pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; common fine roots; few fine discontinuous random tubular impeded pores; strongly acid; clear smooth boundary.

B21t—10 to 18 inches; yellowish red (5YR 5/6) silty clay; common medium distinct strong brown (7.5YR 5/6) and few fine faint light yellowish brown mottles; moderate medium subangular blocky structure; firm; common patchy faint thin clay films on vertical faces of peds; very strongly acid; gradual smooth boundary.

B22t—18 to 27 inches; yellowish red (5YR 5/6) silty clay; many medium prominent red (2.5YR 4/8) mottles; few fine distinct yellowish brown mottles; few fine prominent light brownish gray mottles; moderate medium subangular blocky structure; firm; common patchy faint thin clay films on vertical faces of peds; pressure faces on some vertical and horizontal surfaces of peds; very strongly acid; gradual wavy boundary.

B23t—27 to 42 inches; light brownish gray (10YR 6/2) silty clay; many medium prominent red (2.5YR 4/8) mottles and common fine distinct yellowish brown mottles; strong coarse subangular blocky structure; firm; few fine roots; common patchy faint thin clay films on vertical faces of peds; pressure faces on some vertical and horizontal surfaces of peds; very strongly acid; gradual wavy boundary.

B3—42 to 57 inches; gray (10YR 6/1) clay; many medium prominent red (2.5YR 4/8) mottles; common medium distinct strong brown (7.5YR 5/6)

mottles; weak medium subangular blocky structure; firm; pressure faces on some vertical and horizontal surfaces of peds; strongly acid; clear wavy boundary.

C—57 to 65 inches; yellowish red (5YR 5/6) clay; common fine distinct gray mottles; massive; firm; medium acid.

The thickness of the solum ranges from 40 to 60 inches. The effective cation exchange capacity of this soil is 50 percent or more saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. It is 2 to 4 inches thick and is very strongly acid to medium acid. It is typically silt loam, although the range includes very fine sandy loam.

The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 3. It is strongly acid to medium acid and is silt loam or very fine sandy loam. The thickness of the A2 horizon ranges from 0 to 5 inches.

The upper part of the B2t horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 4 to 6. The lower part has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. Mottles in the B2t horizon are in shades of red, brown, and gray and range from few to many. The B2t horizon is clay or silty clay and ranges from very strongly acid to neutral.

The B3 horizon has hue of 10YR, 5YR, or 2.5YR, value of 4 to 6, and chroma of 1 or 6. Mottles are in shades of red to brown. The B3 horizon is clay or silty clay and ranges from very strongly acid to neutral.

The C horizon is reddish clay or silty clay. It ranges from medium acid to moderately alkaline. Concretions of carbonates range from none to common.

Guyton series

The Guyton series consists of poorly drained, slowly permeable soils that formed in loamy alluvium. These soils are on broad flats and in depressional areas in terrace uplands. They are also on flood plains of streams that drain the uplands. Slopes are less than 1 percent.

Soils of the Guyton series are fine-silty, siliceous, thermic Typic Glossaqualfs.

Guyton soils commonly are near Caddo, Cahaba, and Cascilla soils. Caddo soils are in slightly higher positions and have prominent red mottles in the subsoil. The well drained Cahaba soils are in higher positions and are fine-loamy. The well drained Cascilla soils are on natural levees of small streams and do not have an argillic horizon.

Typical pedon of Guyton silt loam, 8.5 miles southeast of Pollock, 1,500 feet east of parish road, NW1/4SW1/4 sec. 21, T. 6 N., R. 2 E.

A1—0 to 6 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; friable; few coarse roots and common medium roots; few fine concretions of iron and manganese oxides; oxidation stains around root channels; very strongly acid; clear smooth boundary.

A21g—6 to 14 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct yellowish brown mottles; weak medium subangular blocky structure; friable; few medium and fine roots; common very fine discontinuous random tubular impeded pores; few fine concretions of iron and manganese oxides; oxidation stains around root channels; strongly acid; clear wavy boundary.

A22g—14 to 24 inches; light gray (10YR 7/1) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; common fine discontinuous random tubular impeded pores; few fine medium concretions of iron and manganese oxides; oxidation stains around roots; strongly acid; clear irregular boundary.

B&A—24 to 35 inches; grayish brown (10YR 5/2) silty clay loam (B2t); few medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common fine discontinuous random tubular impeded pores; few discontinuous distinct clay films on faces of peds; few fine concretions of iron and manganese oxides; ped coatings, pockets, and tongues of gray (10YR 6/1) silt loam (A2) make up about 15 percent of the horizon; strongly acid; clear wavy boundary.

B2tg—35 to 54 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; few very fine discontinuous random tubular impeded pores; common discontinuous distinct clay films on faces of peds; few concretions of iron and manganese oxides; very strongly acid; gradual wavy boundary.

B3tg—54 to 65 inches; light grayish brown (10YR 6/2) silt loam; few fine distinct strong brown mottles; weak medium subangular blocky structure; firm; few patchy faint thin clay films on some vertical faces of peds; very strongly acid.

The solum ranges from 55 to 80 inches in thickness. The soil ranges from extremely acid to medium acid throughout. The effective cation exchange capacity of this soil is 20 to 50 percent saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 horizon has hue of 10YR, value of 4 to 6, and chroma of 2. It is 3 to 8 inches thick.

The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. It is 11 to 25 inches thick.

The Btg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is silt loam, silty clay loam,

or clay loam. Few to many mottles are in shades of brown or gray.

Kisatchie Series

The Kisatchie series consists of well drained, very slowly permeable soils that formed in clayey sediment over siltstone or sandstone. These soils are in terrace uplands. Slopes range from 5 to 20 percent.

Soils of the Kisatchie series are fine, montmorillonitic, thermic Typic Hapludalfs.

Kisatchie soils commonly are near Briley, Cadeville, Rigolette, Ruston, and Smithdale soils. The well drained Briley soils are on ridgetops and upper side slopes and have more sand than Kisatchie soils. The moderately well drained Cadeville soils are in positions similar to those of Kisatchie soils and are clayey throughout. The somewhat poorly drained Rigolette soils are on concave side slopes and are fine-loamy. The well drained Ruston and Smithdale soils are on upper side slopes and are loamy throughout.

Typical pedon of Kisatchie very fine sandy loam, in an area of Rigolette-Kisatchie association, hilly, 2.25 miles northwest of Breezy Hill, 0.6 mile southwest of Johns Hill Road, SE1/4SE1/4 sec. 16, T. 8 N., R. 1 W.

A1—0 to 5 inches; very dark gray (10YR 3/1) very fine sandy loam; weak fine granular structure; friable; few coarse roots; many fine and medium roots; very strongly acid; clear wavy boundary.

A12—5 to 8 inches; dark grayish brown (10YR 4/2) very fine sandy loam; weak fine subangular blocky structure; friable; many fine and common medium roots; very strongly acid; clear smooth boundary.

B21t—8 to 14 inches; grayish brown (10YR 5/2) clay loam; moderate medium subangular blocky structure; firm; many fine roots; few medium prominent light yellowish brown (10YR 6/6) and reddish yellow (7.5YR 6/6) spots; few fragments of light brownish gray (2.5Y 6/2) sandstone that are 30 millimeters in diameter; few medium roots in clay loam material and between fragments of sandstone; common discontinuous distinct thick clay films on vertical faces of peds; very strongly acid; gradual wavy boundary.

B22t—14 to 24 inches; pale brown (10YR 6/3) silty clay; moderate medium angular blocky structure; firm; common discontinuous distinct thick clay films on vertical faces of peds; few sandstone fragments about 60 millimeters in length and 25 millimeters in width; very strongly acid; clear smooth boundary.

IICr—24 to 60 inches; olive (5Y 5/4) sandstone; weakly cemented plates that have dark grayish brown (10YR 4/2) clay flows along planes; pockets of sand make up 10 percent of the horizon; extremely acid.

The thickness of the solum ranges from 20 to 40 inches over sandstone and siltstone. The effective cation exchange capacity of this soil is 50 percent or more saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is 3 to 6 inches thick and is very strongly acid or strongly acid. Typically, the A1 horizon is very fine sandy loam, although fine sandy loam and silt loam are within the range.

The A12 horizon has hue of 10YR, value of 4, and chroma of 1 or 2. It is very strongly acid or strongly acid and is very fine sandy loam or fine sandy loam.

The B2t horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 2 to 4. Reaction is extremely acid or very strongly acid. Texture is silty clay, silty clay loam, or clay loam. Some pedons have a B3t horizon. Where present, it is 6 to 10 inches thick. Fragments of sandstone and siltstone range from few to common in the B3t horizon and in the lower part of the B2t horizon.

The IIC horizon is sandstone or siltstone.

Kolin Series

The Kolin series consists of moderately well drained soils that formed in silty sediment overlying clayey sediment. Permeability is slow in the upper part of the subsoil and very slow in the lower part. These soils are on broad ridgetops and gentle side slopes in terrace uplands. Slopes range from 1 to 3 percent.

Soils of the Kolin series are fine-silty, siliceous, thermic Glossaquic Paleudalfs.

Kolin soils are similar to Glenmora and Metcalf soils, and commonly are near Gore and Guyton soils. Glenmora soils do not have a clayey subsoil and are in positions on the landscape similar to those of Kolin soils. Gore soils are in lower positions and are clayey throughout. Guyton soils are in depressional areas and are gray and loamy throughout. Metcalf soils are in higher positions and have tongues of gray silt loam in the lower part of the subsoil.

Typical pedon of Kolin silt loam, 1 to 3 percent slopes, 1.75 miles southeast of Montgomery, 4,000 feet west of Highway 71, 730 feet north of R. O. Martin Road, 15 feet east of logging trail, SW1/4NE1/4 sec. 27, T. 8 N., R. 5 W.

A1—0 to 3 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; strongly acid; clear smooth boundary.

A2—3 to 6 inches; brown (10YR 5/3) silt loam; weak fine granular structure; very friable; few fine roots; common medium concretions of iron and manganese oxides; strongly acid; clear wavy boundary.

B21t—6 to 13 inches; strong brown (7.5YR 5/6) silty clay loam; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few fine roots; common medium

discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on faces of some peds; common medium concretions of iron and manganese oxides; light yellowish brown stains in and around root channels; strongly acid; clear smooth boundary.

B22t—13 to 20 inches; strong brown (7.5YR 5/6) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and many fine prominent red mottles; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few fine roots, few medium roots; many medium discontinuous random tubular impeded pores; common continuous distinct thick clay films on surfaces of peds; few medium concretions of iron and manganese oxides; strongly acid; clear wavy boundary.

B&A'2—20 to 28 inches; yellowish brown (10YR 5/6) silty clay loam (B2t); gray (10YR 6/1) silt coatings 2 to 10 millimeters thick surrounding peds (A2); common medium distinct light yellowish brown (10YR 6/4) and common medium prominent red (2.5YR 4/8) mottles; strong coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few fine roots; few fine discontinuous random tubular pores; common continuous distinct thick clay films on surfaces of some peds; silt coatings surrounding peds make up as much as 15 percent of the horizon; strongly acid; clear wavy boundary.

IIB24t—28 to 39 inches; red (2.5YR 4/8) silty clay; many medium distinct gray (10YR 6/1) and strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; common discontinuous distinct thick clay films on surfaces of some peds; strongly acid; clear wavy boundary.

IIB25t—39 to 49 inches; strong brown (7.5YR 5/6) silty clay; few medium distinct yellowish red (5YR 5/8) and few fine distinct light brownish gray mottles; moderate medium subangular blocky structure; firm; few medium roots; common discontinuous distinct thick clay films on surfaces of some peds; gray (10YR 6/1) silt loam in a few root channels; strongly acid; clear wavy boundary.

IIB3t—49 to 74 inches; yellowish red (5YR 4/6) silty clay; common fine distinct light brownish gray mottles; weak medium subangular blocky structure; firm; few patchy faint thin clay films on surfaces of some peds; strongly acid.

The thickness of the solum ranges from 60 to 100 inches. Depth to the IIB horizon ranges from 20 to 60 inches. The effective cation exchange capacity of this soil is 50 percent or more saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 horizon has hue of 10YR, value of 3, and chroma of 1 or 2, or it has value of 4 and chroma of 1 to 3. It is 3 to 7 inches thick and ranges from strongly acid to slightly acid.

The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 3. It ranges from strongly acid to slightly acid.

The B2t horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 to 8. It is silty clay loam or silt loam and ranges from very strongly acid to medium acid.

The IIB horizon has hue of 2.5YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 6 to 8. It is clay or silty clay and ranges from very strongly acid to slightly acid.

Latanier Series

The Latanier series consists of somewhat poorly drained, very slowly permeable soils that formed in clayey over loamy alluvium. These soils are on alluvial plains of the Red River. Slopes are less than 1 percent.

Soils of the Latanier series are clayey over loamy, mixed, thermic Vertic Hapludolls.

Latanier soils commonly are near Armistead, Gallion, and Moreland soils. Armistead soils are in slightly higher positions on the landscape and have less than 20 inches of clayey alluvium over a loamy argillic horizon. Gallion soils are on higher natural levees than Latanier soils and are loamy throughout. Moreland soils are in slightly lower positions and are clayey throughout.

Typical pedon of Latanier clay, 1 mile southeast of Kateland, 1,000 feet west of Bayou Patassa, 150 feet south of parish road, NW1/4 sec. 3, T. 5 N., R. 3 W.

Ap—0 to 6 inches; dark reddish brown (5YR 3/3) clay; strong coarse subangular blocky structure; very firm; many fine roots; neutral; gradual wavy boundary.

B21—6 to 25 inches; reddish brown (2.5YR 4/4) silty clay; moderate medium angular blocky structure; firm; few fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

B22—25 to 34 inches; reddish brown (2.5YR 4/4) silty clay; weak coarse angular blocky structure; firm; few fine roots; few fine light gray mottles; few slickensides; strong effervescence; moderately alkaline; clear wavy boundary.

IIC1—34 to 54 inches; reddish brown (5YR 4/4) silt loam; massive; very friable; few fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

IIC2—54 to 65 inches; yellowish red (5YR 5/6) very fine sandy loam; massive; very friable; strong effervescence; moderately alkaline.

The thickness of the solum and depth to material of contrasting texture range from 20 to 40 inches. The soil ranges from neutral to moderately alkaline throughout.

The A horizon has hue of 7.5YR, value of 3, and chroma of 2; or it has hue of 5YR, value of 3, and chroma of 2 or 3. It is silty clay or clay.

The B2 horizon has hue of 2.5YR, value of 3 or 4, and chroma of 4; or it has hue of 5YR, value of 3 or 4, and chroma of 3 or 4. It is silty clay or clay.

The IIC horizon is either monotextured or stratified. It ranges from very fine sandy loam to silty clay loam.

Latanier soils in Grant Parish are taxadjuncts to the Latanier series because the mollic epipedon is thinner than the defined range for the series. However, this difference does not affect the use and management of the soils.

Malbis Series

The Malbis series consists of moderately well drained soils that formed in loamy sediment. Permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. These soils are on interstream divides and side slopes in terrace uplands. Slopes range from 1 to 5 percent.

Soils of the Malbis series are fine-loamy, siliceous, thermic Plinthic Paleudults.

Malbis soils are similar to Glenmora soils and commonly are near Ruston soils. The Glenmora soils are in lower positions than Malbis soils and have light brownish gray silt interfingering into the subsoil. The Ruston soils are in positions similar to those of Malbis soil and have a redder subsoil.

Typical pedon of Malbis fine sandy loam, 1 to 5 percent slopes, 6.5 miles east of Montgomery, 0.5 mile west of Highway 1240, 30 feet south of International Paper Company road, NE1/4NW1/4 sec. 21, T. 8 N., R. 4 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; friable; common fine roots; strongly acid; clear wavy boundary.

B21t—6 to 14 inches; strong brown (7.5YR 5/8) clay loam; weak medium subangular blocky structure; friable; few fine roots; common fine discontinuous random tubular impeded pores; common discontinuous distinct clay films on surfaces of peds; very strongly acid; gradual wavy boundary.

B22t—14 to 35 inches; yellowish brown (10YR 5/8) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; few fine discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on surfaces of peds; 5 percent plinthite nodules; few fine concretions of iron and manganese oxides; very strongly acid; clear wavy boundary.

B23t—35 to 43 inches; yellowish brown (10YR 5/6) sandy clay loam; common medium prominent red (2.5YR 5/8) and common fine distinct gray mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on surfaces of peds; 15 percent plinthite nodules; few seams of light gray (10YR 7/1) silt loam about 10 millimeters wide and 10 centimeters long; very strongly acid; clear wavy boundary.

B24t—43 to 64 inches; yellowish brown (10YR 5/8) sandy clay loam; common medium prominent red (2.5YR 4/6) and common medium distinct gray (10YR 6/1) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; common medium discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on surfaces of peds; 15 percent plinthite nodules; a few seams filled with gray (10YR 6/1) silt loam; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The effective cation exchange capacity of this soil is 50 percent or more saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is 4 to 8 inches thick and is medium acid or strongly acid.

The B21t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. It is sandy clay loam or clay loam and is very strongly acid or strongly acid.

The other B2t horizons are similar in color to that of the B21t horizon, and they are mottled in shades of brown, gray, and red. Mottles that have chroma of 2 are commonly at a depth of more than 30 inches. Plinthite makes up 5 to 20 percent, by volume, of the lower B2t horizons. The B2t horizons are very strongly acid or strongly acid.

Mayhew Series

The Mayhew series consists of poorly drained, very slowly permeable soils. These soils formed in acid clayey sediment on broad interstream divides in terrace uplands. Slopes range from 0 to 2 percent.

Soils of the Mayhew series are fine, montmorillonitic, thermic Vertic Ochraqualfs.

Mayhew soils commonly are near Cadeville, Kisatchie, and Metcalf soils. Cadeville soils are on side slopes along drainageways and are redder in the upper part of the subsoil than Mayhew soil. Kisatchie soils are on side slopes and are underlain by siltstone or sandstone. Metcalf soils are on slightly higher ridge crests and are more loamy in the upper part of the subsoil.

Typical pedon of Mayhew silty clay loam, 4.5 miles north of Williana, 420 feet west of Highway 167, 30 feet south of U.S. Forest Service Road 558, NW1/4SE1/4 sec. 28, T. 9 N., R. 2 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay loam; weak fine granular blocky structure; friable; common fine and few coarse roots; very strongly acid; clear smooth boundary.

B21tg—5 to 20 inches; gray (10YR 6/1) silty clay; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; slightly plastic; few medium roots; few patchy faint thin clay films on surfaces of some peds; very strongly acid; gradual wavy boundary.

B22tg—20 to 35 inches; light brownish gray (1.5Y 6/2) silty clay; few medium distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; firm; plastic; few fine roots; few patchy faint thin clay films on surfaces of some peds; strongly acid; gradual wavy boundary.

B23tg—35 to 60 inches; light brownish gray (2.5Y 6/2) silty clay; few fine faint light olive brown mottles; strong medium angular blocky structure; firm; plastic; many distinct pressure faces on surfaces of peds; few slickensides that do not intersect; strongly acid; gradual wavy boundary.

B3g—60 to 75 inches; mottled gray (10YR 6/1) and yellowish brown (10YR 5/6) silty clay; strong medium angular blocky structure; firm; plastic; few slickensides that do not intersect; very strongly acid.

The thickness of the solum ranges from 40 to more than 80 inches. Reaction ranges from very strongly acid to medium acid throughout. The effective cation exchange capacity is 50 percent or more saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. It is 2 to 6 inches thick. Typically, the A horizon is silty clay loam; however, the range includes silt loam.

The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The lower part of the B2t horizon and the B3 horizon are mottled in shades of gray, yellow, and brown. The B2t and B3 horizons are clay or silty clay.

Mayhew soils in Grant Parish are taxadjuncts to the Mayhew series because the percent base saturation in the B3g horizon is slightly lower than the defined range for the series. However, this difference does not affect the use and management of the soils.

Metcalf Series

The Metcalf series consists of somewhat poorly drained, very slowly permeable soils. These soils formed in loamy and clayey sediment. They are on ridge crests and interstream divides in terrace uplands. Slopes range from 0 to 2 percent.

Soils of the Metcalf series are fine-silty, siliceous, thermic Aquic Glossudalfs.

Metcalf soils are similar to Kolin soils and commonly are near Cadeville and Mayhew soils. The Kolin soils are in different positions on the landscape and do not have tongues of gray silt loam in the subsoil. The Cadeville soils are on side slopes along drainageways and have more clay in the upper part of the subsoil. The Mayhew soils are in slightly lower positions than Metcalf soils and have a fine textured control section.

Typical pedon of Metcalf very fine sandy loam, 7 miles north of Williana, 1,056 feet east of the intersection of Highway 167 and U.S. Forest Service Road 613, 35 feet north of U.S. Forest Service Road 613, NE1/4NE1/4 sec. 16, T. 9 N., R. 2 W.

A1—0 to 4 inches; brown (10YR 4/3) very fine sandy loam; weak fine granular structure; friable; few coarse and common medium and fine roots; few fine discontinuous random tubular impeded pores; very strongly acid; clear wavy boundary.

A2—4 to 7 inches; light yellowish brown (10YR 6/4) silt loam; common medium faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; few medium roots and few fine roots; few fine discontinuous random tubular impeded pores; very strongly acid; clear smooth boundary.

B21t—7 to 15 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; few medium and few fine roots; few medium discontinuous random tubular impeded pores; common patchy distinct thick clay skins on surfaces of some peds; few fine concretions of iron and manganese oxides; light yellowish brown coatings on vertical surfaces of some peds; very strongly acid; clear wavy boundary.

B22t—15 to 23 inches; yellowish brown (10YR 5/6) silt loam; common fine prominent red and few fine distinct grayish brown mottles; moderate medium subangular blocky structure; friable; few medium and fine roots; common fine discontinuous random tubular impeded pores; common patchy distinct thick clay films on surfaces of some peds; light yellowish brown (10YR 6/4) coatings on surfaces of some peds; very strongly acid; clear wavy boundary.

B23t—23 to 30 inches; yellowish brown (10YR 5/4) loam; many medium distinct grayish brown (10YR 5/2) and few medium prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; few fine roots; few medium discontinuous random tubular impeded pores; common patchy distinct thick clay films on surfaces of some peds; very strongly acid; clear wavy boundary.

B&A'—30 to 37 inches; light brownish gray (10YR 6/2) loam (B2t); common medium distinct strong brown (7.5YR 5/6) and many medium prominent red (2.5YR 4/8) mottles; weak coarse prismatic structure parting to moderate medium subangular

blocky; friable; few fine discontinuous random tubular impeded pores; few patchy faint thin clay films on surfaces of some peds; tongues of light gray (10YR 7/1) silt (A2) 1 to 1.5 centimeters wide make up as much as 30 percent of the horizon; strongly acid; clear wavy boundary.

IIB24t—37 to 48 inches; light brownish gray (10YR 6/2) clay loam; common medium distinct yellowish brown (10YR 5/6) and few medium prominent red (2.5YR 4/8) mottles; weak coarse prismatic structure parting to weak medium angular blocky; firm; few patchy faint thin clay films on surfaces of some peds; few thin patchy light gray (10YR 7/1) silt coatings; very strongly acid; gradual wavy boundary.

IIB25t—48 to 61 inches; light brownish gray (2.5Y 6/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; extremely acid; clear smooth boundary.

C—61 to 75 inches; light brownish gray (2.5Y 6/2) clay; few fine prominent yellowish brown mottles; massive with common bedding planes; firm; few seams of gray (10YR 6/1) silt loam about 5 millimeters wide; common fine barite crystals; extremely acid.

The thickness of the solum ranges from 60 to 80 inches. Depth to a clayey IIB horizon ranges from 27 to 40 inches. Except for surface horizons that have been limed, the soil ranges from extremely acid to medium acid throughout. The effective cation exchange capacity is 50 percent or more saturated with exchangeable alumimum in the control section to a depth of 30 inches or more.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is 3 to 8 inches thick. Typically, the A1 horizon is very fine sandy loam; however, the range includes silt loam.

The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is silt loam, loam, or very fine sandy loam.

The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 8. The lower part of the B2t horizon has few or common mottles that have chroma of 1 to 3. The B2t horizon is loam, clay loam, silt loam, or silty clay loam.

The B part of the B&A' horizon has mottles that have hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is silt loam or loam.

Typically, the IIBt horizon has a grayish matrix that has few to many mottles in shades of red and brown. It is clay loam, clay, or silty clay.

Moreland Series

The Moreland series consists of somewhat poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are in backswamps and on the lower parts of natural levees of the Red River and its distributaries. Slopes range from 0 to 3 percent.

Soils of the Moreland series are fine, mixed, thermic Vertic Hapludolls.

Moreland soils commonly are near Armistead, Gallion, Latanier, Norwood, Roxana, and Yorktown soils. Armistead and Latanier soils are on slightly higher positions than Moreland soils, and they are underlain by loamy material. Gallion, Norwood, and Roxana soils are loamy throughout and are on the higher part of natural levees. Yorktown soils are in ponded backswamps and old stream channels and are grayer in the upper part of the subsoil.

Typical pedon of Moreland clay, 8.2 miles southeast of Colfax, 5,350 feet east of Highway 8, 100 feet east of drainage ditch, 500 feet north of fence, sec. 11, T. 5 N., R. 3 W.

Ap—0 to 4 inches; dark brown (7.5YR 3/2) clay; moderate fine granular structure; firm; few medium and common fine roots; neutral; clear smooth boundary.

A1—4 to 10 inches; dark reddish brown (5YR 3/3) clay; moderate fine subangular blocky structure; firm; common medium and fine roots; mildly alkaline; gradual smooth boundary.

B21—10 to 19 inches; reddish brown (5YR 4/4) clay; moderate fine subangular structure; firm; common fine roots concentrated along vertical faces of peds; few fine soft black bodies; mildly alkaline; gradual wavy boundary.

B22—19 to 31 inches; dark reddish brown (5YR 3/4) clay; few fine faint gray mottles; moderate fine angular blocky structure; firm; distinct slickensides; few fine concretions of carbonates; slight effervescence; mildly alkaline; gradual wavy boundary.

B31—31 to 46 inches; reddish brown (5YR 4/4) clay; weak medium angular blocky structure; firm; few slickensides; common coarse concretions of carbonates; strong effervescence; moderately alkaline; gradual wavy boundary.

B32—46 to 66 inches; reddish brown (5YR 4/4) silty clay; weak medium angular blocky structure; firm; mildly alkaline.

Depth to calcareous layers ranges from 10 to 40 inches. Slickensides are within 40 inches of the surface.

The A horizon has hue of 5YR, value of 2 or 3, and chroma of 2 or 3; or it has hue of 7.5YR, value of 3, and chroma of 2. It is 4 to 12 inches thick and ranges from slightly acid to mildly alkaline. Typically, the A horizon is clay; however, the range includes silt loam.

The B2 horizon has hue of 5YR, value of 3, and chroma of 2 to 4; or it has value of 4 and chroma of 3 or 4. It is clay or silty clay and ranges from neutral to moderately alkaline.

The B3 horizon has hue of 5YR, value of 3, and chroma of 4; or it has value of 4 and chroma of 3 or 4. It is neutral to moderately alkaline. The B3 horizon is silty clay, clay, or silty clay loam. A buried A horizon of silt loam, silty clay loam, clay, or silty clay is in some pedons between depths of 40 and 60 inches.

Norwood Series

The Norwood series consists of well drained, moderately permeable soils that formed in silty alluvium. These soils are on natural levees of the Red River and its distributaries. Slopes range from 0 to 3 percent.

Soils of the Norwood series are fine-silty, mixed (calcareous), thermic Typic Udifluvents.

Norwood soils commonly are near Gallion, Latanier, Moreland, and Roxana soils. Gallion soils are on slightly older natural levees and have a subsoil that is more acid. Roxana soils are on slightly higher parts of natural levees and are coarse-silty. Latanier and Moreland soils are in lower positions than Norwood soils and have a more clayey subsoil.

Typical pedon of Norwood silt loam, 0.75 mile north of Kateland, 2,500 feet east of Highway 8, 300 feet east of Bayou Patassa, 75 feet south of fence, northwest corner of sec. 28, T. 6 N., R. 3 W.

Ap—0 to 8 inches; reddish brown (5YR 4/4) silt loam; weak fine granular structure; very friable; few fine roots; common medium dark organic stains; slight effervescence; mildly alkaline; abrupt smooth boundary.

B2—8 to 20 inches; yellowish red (5YR 4/6) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots and few medium roots; many medium discontinuous random irregular impeded pores; strong effervescence; moderately alkaline; clear wavy boundary.

C1—20 to 33 inches; reddish brown (5YR 4/4) silt loam; massive with few bedding planes; very friable; common medium discontinuous random irregular impeded pores; strong effervescence; moderately alkaline; clear smooth boundary.

C2—33 to 46 inches; reddish brown (5YR 4/4) silty clay loam; massive with common bedding planes; friable; few fine roots; common medium discontinuous random irregular impeded pores; common medium spots of organic stains; strong effervescence; moderately alkaline; clear wavy boundary.

C3—46 to 66 inches; reddish brown (5YR 4/4) silty clay loam; massive with common bedding planes; friable; stratified with thin layers of silty clay and silt loam; strong effervescence; moderately alkaline.

Depth to bedding planes ranges from 10 to 39 inches. The soil is mildly alkaline or moderately alkaline throughout.

The A horizon has hue of 5YR, value of 4 or 5, and chroma of 3 or 4. It is 3 to 14 inches thick and is silty clay loam or silt loam.

The B2 horizon has hue of 5YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam or silt loam.

The C horizon has hue of 5YR, value of 4 to 6, and chroma of 3 to 6. It is silty clay loam, silt loam, or very fine sandy loam. Thin strata of finer and coarser material are common.

Rigolette Series

The Rigolette series consists of somewhat poorly drained, very slowly permeable soils that formed in loamy sediment over clayey sediment. These soils are moderately sloping to moderately steep and are in terrace uplands. Slopes range from 5 to 15 percent.

Soils of the Rigolette series are fine-loamy, siliceous, thermic Typic Ochraqualfs.

Rigolette soils commonly are near Briley, Cadeville, Kisatchie, Ruston, and Smithdale soils. The Briley soils are on narrow ridgetops and have thick sandy surface and subsurface layers. The Cadeville soils are in positions similar to those of Rigolette soils, are clayey throughout, and are redder in the upper part of the subsoil. The Kisatchie soils are on more convex slopes and have sandstone and siltstone within 20 to 40 inches of the surface. The Ruston and Smithdale soils are loamy throughout. Ruston soils are on narrow ridgetops, and Smithdale soils are on the upper parts of side slopes.

Typical pedon of Rigolette loamy fine sand, in an area of Rigolette-Kisatchie association, hilly, 3 miles north of Colfax, 275 feet west of Highway 158, NE1/4NE1/4 sec. 30, T. 7 N., R. 3 W.

A1—0 to 4 inches; grayish brown (10YR 5/2) loamy fine sand; weak fine granular structure; very friable; many fine and medium roots; few fine distinct yellowish brown stains along root channels; strongly acid; clear smooth boundary.

A2—4 to 12 inches; light brownish gray (10YR 6/2) loamy fine sand; many fine distinct yellowish brown mottles; weak fine granular structure; very friable; common fine and few coarse roots; common fine discontinuous random tubular pores; strongly acid; clear smooth boundary.

B1—12 to 17 inches; light brownish gray (10YR 6/2) fine sandy loam; many medium distinct yellowish brown (10YR 5/6) and few medium distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; few medium roots; common medium discontinuous random tubular pores; very strongly acid; clear smooth boundary.

B21tg—17 to 22 inches; gray (10YR 6/1) sandy clay loam; many coarse distinct strong brown (7.5YR

5/8) mottles; few fine prominent yellowish red mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common medium and few fine roots; few light gray (10YR 7/1) silt coatings 1 to 3 millimeters thick on vertical faces of peds; common medium discontinuous random tubular pores; common discontinuous distinct thick clay films on vertical faces of peds; very strongly acid; clear smooth boundary.

B22tg—22 to 32 inches; gray (10YR 6/1) sandy clay loam; many medium distinct strong brown (7.5YR 5/6) and few fine prominent yellowish red mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few coarse and medium roots; few light gray (10YR 7/1) silt coatings on vertical faces of peds; common discontinuous distinct thick clay films on vertical faces of peds; very strongly acid; clear smooth boundary.

IIB23tgb—32 to 37 inches; light gray (10YR 7/1) silty clay; common medium distinct strong brown (7.5YR 5/6) and few coarse faint greenish gray (5GY 5/1) mottles; moderate coarse prismatic structure; very firm, extremely hard; few shiny surfaces on vertical faces of peds; few thin seams of uncoated fine sand on vertical faces of some peds; few fragments of soft sandstone as much as 5 to 30 centimeters thick and 15 to 30 centimeters long; very strongly acid; clear smooth boundary.

IIC1g—37 to 49 inches; light brownish gray (2.5YR 6/2) silty clay; common medium distinct strong brown (7.5YR 5/6) and few coarse faint greenish gray (5GY 5/1) mottles; massive; very firm, extremely hard; few fine roots; very strongly acid; gradual wavy boundary.

IIC2g—49 to 61 inches; light gray (10YR 7/1) silty clay; few medium distinct strong brown (7.5YR 5/6) and few medium prominent red (2.5YR 4/8) mottles; massive; very firm, extremely hard; very strongly acid; gradual wavy boundary.

IIC3g—61 to 75 inches; light brownish gray (2.5Y 6/2) clay; few medium distinct yellowish brown (10YR 5/6) and few medium faint greenish gray (5GY 5/1) mottles; massive; very firm, extremely hard; very strongly acid.

Depth to the clayey IIB and IIC horizons ranges from 20 to 60 inches, although it is typically 20 to 50 inches. Typically, fragments of soft sandstone or siltstone are in some parts of the IIB or IIC horizons. Base saturation at 50 inches below the top of the argillic horizon ranges from 45 to 70 percent. The effective cation exchange capacity is 50 percent or more saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 3. It is loamy fine sand or fine sandy loam and is very strongly acid or strongly acid.

The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2. Mottles in shades of brown are typical; however, some pedons do not have mottles. The A2 horizon is fine sandy loam or loamy fine sand and is very strongly acid or strongly acid.

The B1 horizon has hue of 10YR, value of 4 or 5, and chroma of 1, or it has value of 6 and chroma of 1 or 2. It is fine sandy loam, loam, or sandy clay loam and is very strongly acid or strongly acid. Mottles in shades of red or brown range from few to many and are fine to coarse.

The B2tg horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 1, or it has value of 6 and chroma of 1 or 2. It is loam or sandy clay loam, and is very strongly acid or strongly acid. Content of clay ranges from 20 to 35 percent. Mottles in shades of red or brown range from few to many and from fine to coarse.

The IIBtgb and IICg horizons have hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 or 2. They are silty clay or clay and range from extremely acid to mildly alkaline. Weathered volcanic glass makes up a significant amount of the very fine sand fraction. Fine to coarse fragments of soft sandstone or siltstone range from few to common in part or all of the IIB and IIC horizons.

Roxana Series

The Roxana series consists of well drained, moderately permeable soils that formed in loamy alluvium. These soils are on natural levees of the Red River and its distributaries. Slopes range from 0 to 3 percent.

Soils of the Roxana series are coarse-silty, mixed, nonacid, thermic Typic Udifluvents.

Roxana soils commonly are near Gallion, Latanier, Moreland, and Norwood soils. The Gallion soils are on older natural levees, have a fine-silty argillic horizon, and are more acid than Roxana soils. The Latanier and Moreland soils are in lower positions and have a clayey argillic horizon. The Norwood soils are in slightly lower positions than Roxana soils and are fine-silty.

Typical pedon of Roxana very fine sandy loam, 0.9 mile west of Kateland, 4,500 feet west of Highway 8, 500 feet north of Kateland Loop Road, south-central part of sec. 34, T. 6 N., R. 3 W.

Ap—0 to 6 inches; yellowish red (5YR 4/6) very fine sandy loam; weak fine granular structure; very friable; common fine roots; neutral; clear smooth boundary.

C1—6 to 15 inches; yellowish red (5YR 5/6) very fine sandy loam; common medium and fine reddish brown mottles (5YR 4/4); weak medium subangular blocky structure; very friable; indistinct remnants of

weak bedding planes; common fine black bodies; moderately alkaline; clear smooth boundary.

C2—15 to 26 inches; yellowish red (5YR 5/6) loamy very fine sand; massive; very friable; common fine bedding planes; few medium spots of strong brown (7.5YR 5/6) oxidation; slight effervescence; moderately alkaline; gradual wavy boundary.

C3—26 to 44 inches; yellowish red (5YR 4/6) silt loam; massive; very friable; few fine bedding planes; slight effervescence; moderately alkaline; gradual wavy boundary.

C4—44 to 65 inches; yellowish red (5YR 5/6) very fine sandy loam; massive; common bedding planes; slight effervescence; moderately alkaline.

Bedding planes are evident in the 10- to 40-inch control section.

The A horizon has hue of 5YR, value of 3 or 4, and chroma of 4 to 6. It is 3 to 7 inches thick and ranges from slightly acid to moderately alkaline. It is silt loam, very fine sandy loam, or loamy very fine sand.

The C horizon typically has hue of 5YR, value of 4 or 5, and chroma of 6 or 8. Some pedons have hue of 7.5YR, value of 4 or 5, and chroma of 4 to 8. The C horizon ranges from neutral to moderately alkaline and is silt loam, very fine sandy loam, or loamy very fine sand. Some pedons have thin strata of finer or coarser textured material.

Ruston Series

The Ruston series consists of well drained, moderately permeable soils that formed in loamy sediment. These soils are in terrace uplands. Slopes range from 1 to 8 percent.

Soils of the Ruston series are fine-loamy, siliceous, thermic Typic Paleudults.

Ruston soils are similar to Cahaba soils and are near Malbis, Rigolette, and Smithdale soils. The Cahaba soils are on low stream terraces and have a thinner solum than Ruston soils. The Malbis soils are in positions similar to those of Ruston soils and are more than 5 percent plinthite in the subsoil. The Rigolette soils are on side slopes and are underlain by clayey material. The Smithdale soils are on steeper side slopes and do not have a bisequal profile.

Typical pedon of Ruston fine sandy loam, 1 to 5 percent slopes, 5 miles south of Verda, 75 feet east of International Paper Company road, 10 feet north of logging trail, NE1/4SW1/4 sec. 33, T. 8 N., R. 4 W.

A1—0 to 4 inches; brown (10YR 5/3) fine sandy loam; weak fine granular structure; very friable; many fine roots; few medium and coarse roots; common fine discontinuous random irregular impeded pores; strongly acid; clear smooth boundary.

A2—4 to 14 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak fine granular structure; very friable; few fine and common coarse roots; strongly acid; gradual smooth boundary.

B21t—14 to 33 inches; reddish brown (5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; few medium roots; common medium discontinuous random irregular impeded pores; common discontinuous distinct thick clay films on surfaces of peds; yellowish red (5YR 5/6) in interior of peds; very strongly acid; clear smooth boundary.

B22t—33 to 43 inches; yellowish red (5YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable; common fine discontinuous random irregular impeded pores; few discontinuous distinct thick clay films on vertical surfaces of peds; very strongly acid; gradual wavy boundary.

B&A'2—43 to 58 inches; yellowish red (5YR 5/6) fine sandy loam (B2t); weak medium subangular blocky structure; friable; common fine discontinuous random irregular impeded pores; common patchy thin faint clay films on surfaces of some peds; about 35 percent light yellowish brown (10YR 6/4) A'2 material; few medium hard concretions and few pieces of gravel; very strongly acid; clear wavy boundary.

B'21t—58 to 69 inches; yellowish red (5YR 5/8) fine sandy loam; few fine distinct gray mottles; weak medium subangular blocky structure; firm; few patchy faint thin clay films on surfaces of some peds; yellowish brown coatings on about 10 percent of the surfaces of peds; very strongly acid; clear wavy boundary.

B'22t—69 to 75 inches; red (2.5YR 4/8) sandy clay loam; moderate medium subangular blocky structure; firm; common discontinuous distinct thick clay films on surfaces of peds; some abandoned root channels filled with yellowish brown material; very strongly acid.

The solum is more than 60 inches thick. The clay content decreases from the upper part of the Bt horizon to the B&A'2 horizon and then increases in the B't horizon. In some pedons quartz gravel makes up as much as 15 percent, by volume, of the solum. The effective cation exchange capacity is 20 to 50 percent saturated with exchangeable aluminum in the control section to a depth of 30 inches or more.

The A1 and A2 horizons have hue of 10YR, value of 4 to 6, and chroma of 2 to 4. They range from strongly acid to slightly acid. Typically, the A1 and A2 horizons are fine sandy loam; however, gravelly sandy loam is within the range. The A1 horizon is 3 to 6 inches thick.

The Bt and B't horizons have hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. They are sandy clay loam or fine sandy loam and range from very strongly acid to medium acid.

The A'2 part of the B&A'2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is fine sandy

loam or sandy loam. The A'2 part makes up as much as 50 percent of the B&A'2 horizon.

Smithdale Series

The Smithdale series consists of well drained, moderately permeable soils that formed in loamy sediment. These soils are on side slopes in terrace uplands. Slopes range from 5 to 12 percent.

Soils of the Smithdale series are fine-loamy, siliceous, thermic Typic Paleudults.

Smithdale soils commonly are near Briley, Cadeville, Malbis, and Ruston soils and are similar to Cahaba soils. The Briley soils are on ridgetops and side slopes and have sandy surface and subsurface layers 20 to 40 inches thick. The Cadeville soils are on side slopes at a lower elevation than Smithdale soils and have a clayey subsoil. The Cahaba soils are on low stream terraces and have a thinner solum. The Malbis soils are in more nearly level areas on ridgetops and have plinthite in the subsoil. The Ruston soils are on ridgetops and have a bisequal profile.

Typical pedon of Smithdale fine sandy loam, 5 to 12 percent slopes, 3.5 miles northwest of Dry Prong, 1,400 feet south of the intersection of U.S. Forest Service Roads 196A and 133, 50 feet west of U.S. Forest Service Road 133, NW1/4NW1/4 sec. 3, T. 7 N., R. 2 W.

A1—0 to 4 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; common fine roots; strongly acid; clear smooth boundary.

A2—4 to 9 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium granular structure; very friable; few medium and fine roots; strongly acid; clear smooth boundary.

B21t—9 to 24 inches; yellowish red (5YR 5/6) sandy clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common fine discontinuous random tubular impeded pores; common discontinuous distinct thick clay films on vertical and horizontal surfaces of peds; strongly acid; clear smooth boundary.

B22t—24 to 44 inches; yellowish red (5YR 5/6) sandy loam; weak medium subangular blocky structure; friable; few fine roots; common medium discontinuous random irregular impeded pores; few patchy faint thin clay films on surfaces of some peds; strongly acid; gradual wavy boundary.

B23t—44 to 65 inches; red (2.5YR 4/6) sandy loam; weak medium subangular blocky structure; friable; few patchy faint thin clay films on surfaces of some peds; few pockets of uncoated sand grains; strongly acid.

The thickness of the solum ranges from 60 inches to more than 100 inches. The soil is very strongly acid or strongly acid throughout. The content of gravel ranges from 0 to about 10 percent, by volume, throughout the profile.

The A1 horizon has hue of 10YR, value of 3, and chroma of 2, or it has value of 4 and chroma of 1 to 3. Typically, it is fine sandy loam; however, sandy loam and loamy sand are within the range. The thickness ranges from 3 to 10 inches.

The A2 and Ap horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 6. Typically, they are fine sandy loam; however, sandy loam and loamy sand are within the range.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. The upper part of the Bt horizon is sandy clay loam, clay loam, or loam. The lower part of the Bt horizon has few to many pockets of uncoated sand grains. It is sandy loam or loam.

Sumter Variant

The Sumter Variant consists of well drained, slowly permeable soils that formed in calcareous, clayey sediment. These soils are in terrace uplands. Slopes range from 1 to 5 percent.

Sumter Variant soils are fine-silty, carbonatic, thermic Rendollic Eutrochrepts.

Sumter Variant soils commonly are near Cadeville and Vaiden soils. The Cadeville soils are on side slopes and are acid throughout. The Vaiden soils are on interstream divides and are more acid in the upper part of the solum than Sumter Variant soils.

Typical pedon of Sumter Variant silty clay loam, 1 to 5 percent slopes, 7.5 miles north of Williana, 150 feet south of U.S. Forest Service Road 613A, NW1/4,SW1/4 sec. 5, T. 9 N., R. 2 W.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam; moderate fine granular structure; friable; many fine roots; moderately alkaline; strong effervescence; clear smooth boundary.

B1—6 to 10 inches; light yellowish brown (2.5Y 6/4) silty clay; few fine faint yellowish brown mottles; moderate medium granular structure; friable; common fine roots; some root channels filled with dark grayish brown (10YR 4/2) silty clay loam; few dark worm casts; few fine concretions of carbonates; strong effervescence; moderately alkaline; clear smooth boundary.

B2—10 to 20 inches; pale yellow (2.5Y 7/4) silty clay; few fine distinct yellowish brown and few fine faint light brownish gray mottles; moderate medium subangular blocky structure parting to moderate fine subangular blocky; firm; few fine roots; common fine concretions of carbonates; few soft accumulations

of carbonates; strong effervescence; moderately alkaline; gradual smooth boundary.

B3—20 to 28 inches; pale yellow (2.5Y 7/4) silty clay; common fine and medium yellowish brown (10YR 5/6) mottles; common fine and medium faint light brownish gray (2.5Y 6/2) mottles; moderate fine subangular blocky structure; firm; common fine and medium concretions of carbonates; few soft accumulations of carbonates; strong effervescence; moderately alkaline; clear smooth boundary.

C—28 to 60 inches; pale yellow (5Y 7/3) silty clay; common fine and medium distinct yellowish brown (10YR 5/6) and common fine and medium faint light brownish gray (2.5Y 6/2) mottles; massive; few bedding planes; common fine and medium concretions of carbonates; few soft accumulations of carbonates; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick. The calcium carbonate equivalent ranges from 40 to 65 percent. The soil is mildly alkaline or moderately alkaline throughout.

The A horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 or 4, and chroma of 1 or 2. It is 4 to 7 inches thick.

The B1 horizon has hue of 2.5Y, value of 6 or 7, and chroma of 4. In some pedons it has hue of 5Y, value of 5 or 6, and chroma of 3. It is silty clay, clay, or silty clay loam.

The B2 horizon has hue of 2.5Y, value of 6 or 7, and chroma of 4, or it has hue of 5Y, value of 5 to 7, and chroma of 3 or 4. It is silty clay or clay. Soft or hard accumulations of lime are few or common.

The B3 horizon has hue of 2.5Y, value of 5 to 7, and chroma of 4, or it has hue of 5Y, value of 6 or 7, and chroma of 3 or 4. It is silty clay or clay. Soft or hard accumulations of lime are few or common.

The C horizon has hue of 2.5Y, value of 6 or 7, and chroma of 2, or it has hue of 5Y, value of 6 or 7, and chroma of 1 to 3. Soft or hard accumulations of lime range from few to common.

Una Series

The Una series consists of poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are on the flood plain of the Little River. They are frequently flooded. Slopes are less than 1 percent.

Soils of the Una series are fine, mixed, acid, thermic Typic Haplaquepts.

The Una soils commonly are near Guyton and Urbo Variant soils. The Guyton and Urbo Variant soils are in higher positions and are loamy throughout.

Typical pedon of Una silty clay, frequently flooded, 9.5 miles southeast of Pollock, 3,200 feet south of Little River, 20 feet east of pipeline, sec. 22, T. 6 N., R. 2 E.

A1—0 to 6 inches; gray (10YR 5/1) silty clay; common fine faint dark grayish brown mottles; moderate medium angular blocky structure; firm; common fine roots; common medium discontinuous irregular impeded pores; common dark brown organic stains; strongly acid; clear wavy boundary.

B21g—6 to 15 inches; dark gray (10YR 4/1) silty clay; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure parting to moderate fine angular blocky; firm, plastic, sticky; few fine roots and common medium roots; oxidation stains in root channels; very strongly acid; gradual wavy boundary.

B22g—15 to 31 inches; gray (10YR 5/1) silty clay; few medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure parting to moderate fine angular blocky; firm, plastic, sticky; few coarse and fine roots; few soft black concretions; very strongly acid; gradual wavy boundary.

B23g—31 to 80 inches; gray (10YR 5/1) silty clay; few fine distinct strong brown mottles; weak angular blocky structure; firm, plastic, sticky; very strongly acid.

The solum is more than 60 inches thick. The soil is very strongly acid or strongly acid throughout.

The A1 horizon has hue of 10YR, 2.5Y, value of 4 to 7, and chroma of 1 or 2. It is 4 to 6 inches thick. Typically, the A1 horizon is silty clay; however, it ranges from clay to silty clay loam.

The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7, and chroma of 1 or 2. It is clay or silty clay.

Urbo Variant

The Urbo Variant consists of somewhat poorly drained, slowly permeable soils that formed in loamy alluvium. These soils are on low ridges within the flood plain of the Little River. They are occasionally flooded. Slopes range from 0 to 2 percent.

Urbo Variant soils are fine-silty, mixed, acid, thermic Aeric Haplaquepts.

The Urbo Variant soils differ from the Urbo soils in having a fine-silty control section.

Urbo Variant soils commonly are near Guyton and Una soils. The Guyton soils are on fans of adjacent tributary streams and have an argillic horizon. The Una soils are in lower positions and have a fine-textured control section.

Typical pedon of Urbo Variant silty clay loam, occasionally flooded, 10.3 miles southeast of Pollock, 50 feet west of pipeline, sec. 26, T. 6 N., R. 2 E.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) silty clay loam; weak fine subangular blocky structure; friable; common fine roots; common medium strong brown (7.5YR 5/6) stains; strongly acid; clear wavy boundary.

B21g—4 to 22 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium distinct strong brown mottles (7.5YR 5/6); moderate medium subangular blocky structure; firm; few medium roots; few fine discontinuous irregular impeded pores; strongly acid; clear wavy boundary.

B22g—22 to 31 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct strong brown (7.5YR 5/8) and common medium prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm; few medium and fine roots; very strongly acid; clear wavy boundary.

IIB3g—31 to 46 inches; light brownish gray (10YR 6/2) sandy clay loam; common medium distinct yellowish brown (10YR 5/6) mottles and many medium prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; firm; very strongly acid; clear wavy boundary.

IICg—46 to 70 inches; gray (10YR 6/1) fine sandy loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive with common thin bedding planes; very friable; few strong brown (7.5YR 5/8) stains; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. The soil is very strongly acid or strongly acid throughout. Mottles in shades of brown and red range from few to many throughout the solum.

The A horizon typically has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2. Some pedons have hue of 10YR, value of 4 or 5, and chroma of 3. The A horizon is 4 to 8 inches thick. It is silty clay loam or silt loam.

The B21g horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. Mottles in shades of gray, brown, or yellow range from few to many.

The B22g horizon has hue of 10YR or 2.5Y. Pedons that have hue of 10YR have value of 5 to 7 and chroma of 1 or 2. Pedons that have hue of 2.5Y have value of 5 to 7 and chroma of 2.

The IIB3g horizon is similar in color to the B22g horizon. It is sandy clay loam or loam.

The IICg horizon has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 1 or 2. It is fine sandy loam, very fine sandy loam, or loam.

Vaiden Series

The Vaiden series consists of somewhat poorly drained, very slowly permeable soils that formed in acid clay underlain by alkaline clay. These soils are in terrace uplands. Slopes range from 1 to 5 percent.

Soils of the Vaiden series are very-fine, montmorillonitic, thermic Vertic Hapludalfs.

Vaiden soils commonly are near Cadeville and Sumter soils. The Cadeville soils are on side slopes and are acid throughout. The Sumter soils are in slightly higher positions and are calcareous throughout.

Typical pedon of Vaiden silty clay, 1 to 5 percent slopes, 8.4 miles northeast of Williana, 50 feet south of U.S. Forest Service Road 613, SW1/4SE1/4 sec. 6, T. 9 N., R. 2 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silty clay; moderate medium granular structure; firm; common fine roots; strongly acid; abrupt wavy boundary.

B21t—3 to 11 inches; yellowish brown (10YR 5/4) clay; many medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium angular and subangular blocky structure; firm; common medium roots; strongly acid; gradual wavy boundary.

B22t—11 to 21 inches; yellowish brown (10YR 5/4) clay; common medium prominent red (2.5YR 4/8) and few fine distinct grayish brown mottles; moderate medium subangular blocky structure; firm; few fine roots; common intersecting slickensides; strongly acid; gradual wavy boundary.

C1—21 to 32 inches; gray (10YR 6/1) clay; common fine distinct strong brown (7.5YR 5/6), few medium prominent red and few fine faint grayish brown mottles; massive; firm; common intersecting slickensides; few fine roots along faces of slickensides; medium acid; gradual wavy boundary.

C2—32 to 50 inches; mottled pale brown (10YR 6/3), gray (5Y 6/1), and yellowish brown (10YR 5/6) clay; massive with many intersecting slickensides; firm; grooved shiny faces on slickensides; slightly acid; clear wavy boundary.

C3—50 to 75 inches; mottled pale brown (10YR 6/3), gray (5Y 6/1), and strong brown (7.5YR 5/6) clay; massive with few slickensides; firm; few concretions of carbonates; mildly alkaline.

The solum is less than 45 inches thick. Depth to alkaline material ranges from 36 to 72 inches. The upper part of the solum ranges from medium acid to very strongly acid. The lower part of the C horizon ranges from very strongly acid to moderately alkaline. Intersecting slickensides are at a depth of 24 inches or more.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. It is 3 to 6 inches thick.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 8. Mottles in shades of gray, brown, and red range from few to many. The Bt horizon is silty clay or clay.

The C horizon is silty clay or clay. Nodules of lime range from few to common in the lower part.

Yorktown Series

The Yorktown series consists of very poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are in low, ponded backswamps,

sloughs, and abandoned channels of the Red River and its distributaries. Slopes are dominantly less than 1 percent.

Soils of the Yorktown series are very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents.

Yorktown soils are similar to Una and Urbo Variant soils and commonly are near Armistead, Latanier, and Moreland soils. Una and Urbo Variant soils are on the flood plain of the Little River and its distributaries and are more acid throughout than Yorktown soils. Armistead, Latanier, and Moreland soils are in higher positions than Yorktown soils and are redder throughout. In addition, these soils crack to a depth of 20 inches or more in most years.

Typical pedon of Yorktown silty clay, 1.4 miles north-northeast of Aloha, 5,000 feet northeast of Highway 71, 150 feet east of fence, NE1/4SW1/4 sec. 10, T. 7 N., R. 4 W.

A1—0 to 5 inches; grayish brown (10YR 5/2) silty clay; few fine distinct dark brown mottles; weak coarse subangular blocky structure; very sticky, firm; many fine roots; medium acid; abrupt smooth boundary.

B21g—5 to 17 inches; gray (10YR 5/1) clay; common fine prominent yellowish red mottles; moderate coarse angular blocky structure; very sticky, very firm; common fine roots; slightly acid; clear smooth boundary.

B22g—17 to 32 inches; dark gray (10YR 4/1) clay; many medium prominent yellowish red (5YR 5/6) mottles; moderate medium angular blocky structure; very sticky, very firm; few common roots; common fine black bodies; neutral; clear smooth boundary.

B23g—32 to 45 inches; dark gray (5Y 4/1) clay; many fine prominent yellowish red and common fine distinct yellowish brown mottles; moderate medium angular blocky structure; very sticky, very firm; few fine roots; neutral; clear smooth boundary.

B3—45 to 65 inches; reddish brown (5YR 4/4) clay; many medium distinct greenish gray (5BG 5/1) and few medium distinct gray (10YR 5/1) mottles; moderate medium angular blocky structure; sticky, very firm; few fine pressure faces; moderately alkaline.

The solum ranges from 50 to 80 inches in thickness. Depth to the more reddish B3 horizon ranges from 40 to 50 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is 4 to 10 inches thick and ranges from medium acid to neutral. It is typically silty clay; however, clay is within the range.

The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1. Mottles are fine or medium and yellowish red or strong brown. The B2g horizon ranges from medium acid to neutral.

The B3 horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 3 or 4. Mottles in shades of gray range from few to common. The B3 horizon is mildly alkaline or moderately alkaline. In some pedons it is calcareous.

Formation of the Soils

In this section, the processes of soil formation are discussed and related to the soils in the survey area.

Processes of Soil Formation

The processes of soil formation are those actions or events in soils that influence the kind and degree of development of soil horizons. The rate and relative effectiveness of different processes are determined by the factors of soil formation: climate, living organisms, relief, parent material, and time.

Important soil forming processes are those that result in (1) additions of organic, mineral, and gaseous materials to the soil;(2) losses of these materials from the soil; (3) translocation of materials from one point to another within the soil; and (4) physical and chemical transformation of mineral and organic materials within the soil (*26*).

Typically, many processes occur simultaneously in soils. Examples in the survey area include accumulation of organic matter, development of soil structure, and leaching of bases from some soil horizons. The contribution of a particular process may change over a period of time. For example, installation of drainage and water control sytems can change the length of time some soils are flooded or saturated with water. Some important processes that have contributed to the formation of the soils in Grant Parish are discussed in the following paragraphs.

Organic matter has accumulated, undergone partial decomposition, and been incorporated into all of the soils. Production of organic matter takes place mostly in and above the surface layer. Because of this, the surface layer of soils is higher in organic matter content than other deeper horizons. The decomposition, incorporation, and mixing of organic residue into the soil is accomplished largely by the activity of living organisms. Many of the more stable products of decomposition remain as finely divided materials that make the soil darker and increase the water holding and cation exchange capacities and granulation in the soil.

The deposition of alluvial sediment on the surface has been important in the formation of several soils. The added sediment provides new parent material in which processes of soil formation must then begin; consequently, soils that have formed under these conditions may not have prominent horizons. Roxana and Norwood soils, for example, formed in recent, loamy deposits on natural levees of the Red River, and Armistead, Latanier, and Moreland soils formed in areas that have accumulations of clayey backswamp deposits.

Processes that develop soil structure have occurred in all of the soils. Plant roots and other organisms contribute to the rearrangement of soil material into secondary aggregates. The decomposition of organic residue and the secretions of organisms serve as cementing agents that help to stabilize the structural aggregates. Alternate wetting and drying together with shrinking and swelling contribute to the development of structural aggregates, particularly in soils that have appreciable amounts of clay. Armistead, Latanier, and Moreland soils are examples.

About one-half of the soils in Grant Parish have horizons in which reduction and segregation of iron and manganese compounds are important processes. The conditions that result in the reduction of these compounds prevail for long periods in poorly aerated horizons; consequently, the relatively soluble, reduced forms of iron and manganese are predominant over the less soluble, oxidized forms. Reduced compounds of these elements account for the gray in the Bg and Cg horizons that is characteristic of many of the soils in Grant Parish. In the more soluble reduced form, appreciable amounts of iron and manganese can be removed from the soils or translocated from one position to another within the soil by water. The presence of brownish mottles in predominantly gray horizons indicates the segregation and local concentration of oxidized iron compounds caused by alternating oxidizing and reducing conditions in the soil. Well drained and somewhat excessively drained soils do not have the grayness associated with wetness and poor aeration, and they apparently are not dominated by reducing conditions for significant periods of time.

Loss of components from the soils has been an important process in the formation of soils. Water moving through the soil has leached many soluble components from horizons of most of the soils in the parish. These components include free carbonates that may have been present initially. Soils that formed in recent Red River alluvium are less severely leached than other soils in the parish. In places the Moreland, Norwood, and Roxana soils may have free calcium carbonate throughout the profile, which indicates that these young soils have had little leaching. The soils in

uplands that formed in deposits of Tertiary age are generally acid throughout and are the most highly leached soils in the parish. Although the soils that formed in sediment of Pleistocene age may be highly leached, particularly in the upper horizons, they are generally less severely leached than soils that formed in older deposits of Tertiary age.

The formation, translocation, and accumulation of clay in the profile have been important processes during the formation of most of the soils in Grant Parish. Silicon and aluminum released as a result of weathering of minerals, such as hornblende, amphibole, and feldspars, can recombine with the components of water to form secondary clay minerals, such as kaolinite. Layered silicate minerals, such as biotite, glauconite, and montmorillonite, also can weather to form other clay minerals, such as vermiculite or kaolinite. Clay accumulates in horizons largely by translocation from upper to lower horizons. As water moves downward, it carries small amounts of clay in suspension. This clay is deposited and accumulates at the depths penetrated by water or in horizons where it becomes flocculated or filtered out by fine pores in the soil. Over long periods, such processes result in distinct horizons of clay accumulation. Most of the soils in Grant Parish have a subsoil characterized by an accumulation of clay. Cascilla, Latanier, Moreland, Norwood, Roxana, Sumter Variant, Una, Urbo Variant, and Yorktown soils, however, do not have such an accumulation.

Secondary accumulation of calcium carbonate in the lower soil horizons has been an important process in some of the soils in Grant Parish. Initially, free carbonates were in all of the soils that formed in the recent Red River alluvial deposits. These carbonates still are present throughout most of the horizons of the Roxana, Norwood, and Moreland soils. Large amounts of free carbonates were also present in the marly clays of Tertiary age. These carbonates still are present throughout the Sumter Variant soils. The Armistead and Gallion soils, which formed in recent Red River alluvium, and the Gore soils, which formed in the older sediment of Pleistocene age, may in places have secondary accumulations of carbonates at a depth of less than 60 inches. Carbonates dissolved from overlying horizons may have been translocated to these depths by water and redeposited. Other sources and processes that contribute in varying degrees to these carbonate accumulations are segregation of material within the horizon; upward translocation of materials in solution from deeper horizons during fluctuations of water table levels; and contributions of material from readily weatherable minerals, such as plagioclase.

Factors of Soil Formation

Soils are natural, three-dimensional bodies that formed on the earth's surface and that have properties resulting from the integrated effect of climate and living matter acting on parent material, as conditioned by relief over periods of time.

The interaction of five main factors influences the processes of soil formation and results in differences among the soils. These factors are the physical and chemical composition of the parent material; the kind of plants and other organisms living in and on the soil; the relief of the land and its effect on runoff and soil temperature and moisture conditions; and the length of time it took the soil to form.

The effect of any one factor can differ from place to place, but the interaction of all the factors determines the kind of soil that forms. Because of these interactions, many of the differences in soils cannot be attributed to differences in only one factor. For example, organic matter content in the soils of Grant Parish is influenced by several factors including relief, parent material, and living organisms. Such interactions do not preclude recognition of the manner in which a given factor can influence a specific soil property. In the following paragraphs the factors of soil formation are discussed as they relate to soils in the survey area.

Climate

Grant Parish is characterized by a humid, subtropical climate. A detailed discussion of the present climate in the parish is given in the section "General Nature of the Survey Area."

Because the climate is relatively uniform throughout the parish, local differences in the soils are not caused by large differences in atmospheric climate. The warm average temperatures and large amounts of precipitation favor a rapid rate of weathering of readily weatherable minerals in the soils. Ancient climates (Paleoclimates) in the area, however, may have differed considerably from present day climate. Some of the differences among soils formed on old landscapes may be caused partly by climate differences over periods of thousands of years.

In landscapes of comparable age, differences in weathering, leaching, and translocation of clay are caused chiefly by variations in factors other than atmospheric climate. Weathering processes involving the release and reduction of iron are indicated by the gray in the Ag, Bg, or Cg horizons in some of the soils. Oxidation and segregation of iron as a result of alternating conditions of oxidation and reduction are indicated by mottled horizons and iron and manganese concretions in many of the soils.

An important effect of climate is shown in clayey soils that have appreciable amounts of expanding lattice minerals. In these clayey soils large changes in volume take place upon wetting and drying. Wetting and drying cycles, and the volume changes associated with them, are important factors in the formation and stabilization of structural aggregates in clayey soils.

When wet soils become dry, cracks of variable width and depth can form as the result of a decrease in volume, and when cracks form, the depth and extent of cracking are influenced by climate. Repeated large changes in volume frequently result in structural problems for buildings, roads, and other structures. Deep, wide cracks may shear the roots of some plants growing in the soil. Where cracks are present, much of the water from initial rainfall or irrigation is filtered through the cracks. Once the soil becomes wet, however, infiltration rates are slow or very slow. Cracks form extensively in Armistead, Latanier, Mayhew, Vaiden, and Moreland soils late in summer and early in fall at which time the soils are driest. During this time, cracks of an inch or more in width and extending to a depth of more than 20 inches can form in most years. Cracks that are less extensive and less deep also sometimes form in less clayey soils, such as the Norwood soils.

Living Organisms

Living organisms exert a major influence on the kind and extent of horizons that develop in a soil. The growth of plants and activity of other organisms physically disturb the soil, and the disturbance in turn modifies the porosity and influences structural formation and incorporation of organic matter into the soil. Photosynthesis of plants utilizes energy from the sun to synthesize compounds necessary for growth and in this way produces additional organic matter. The growth of plants and their eventual death and decomposition provide a recycling of nutrients from the soil into the plant and back into the soil. This recycling is a major source of organic residue. Decomposition and incorporation of organic matter into the soil by micro-organisms add to the development of structure and generally increase the infiltration rate and available water holding capacity in the soil.

Because relatively stable organic compounds in soils generally have very high cation exchange capacities, they increase the capacity of the soil to absorb and store nutrients, such as calcium, magnesium, and potassium. The extent of these and other processes and the kind of organic matter produced can very widely, depending on the kind of organisms living in and on the soil. For example, the organic matter content of soils formed under prairie vegetation is typically higher than that formed in soils under forest (*13, 29*).

The native vegetation throughout nearly all of Grant Parish was forest. The uplands were covered with mixed hardwood-pine forest. Generally, pine was prevalent on most of the soils formed in the parent material of Tertiary and early Pleistocene age, and hardwoods were dominant on soils formed in parent material of late Pleistocene age. The soils on bottom lands that formed in recent alluvial sediment were covered by hardwood forest.

Differences in the amount of organic matter that has accumulated in and on the soils is influenced by the kinds of and populations of micro-organisms. Aerobic organisms use oxygen from the air and are chiefly responsible for the decomposition of organic matter through rapid oxidation of organic residue. These organisms are most abundant and prevail for longer periods in the better drained, more aerated soils.

In the more poorly drained soils, anaerobic organisms are predominant for longer periods during the year. Anaerobic organisms do not require oxygen from the air, and they decompose organic residue very slowly. Differences in decomposition by micro-organisms can result in larger accumulations of organic matter in soils that have restricted drainage than in better drained soils. In general, the content of organic matter is higher in areas where the soil is more poorly drained and not well aerated.

Relief

Relief and other physiographic features influence soil formation processes by affecting internal soil drainage, runoff, erosion and deposition, and exposure to the sun and wind.

The influence of relief on the soils in Grant Parish is especially evident in the rates at which water runs off the surface, in the internal soil drainage, and in depths and duration of a seasonal high water table in some of the soils. The alluvial plain of the Red River generally has less relief than the Pleistocene and Tertiary Terraces of the uplands. Roxana, Gallion, Norwood, Armistead, and Moreland soils, which formed in Red River alluvium, have progressively less relief and are at progressively lower elevation in the order in which the soils are listed. For example, the nearly level Gallion soils typically are on narrow ridges, and the level Moreland soils are in depressional areas. Surface runoff is slow on the Roxana soils, and it becomes progressively slower in the order in which the soils are listed. Depth and duration of a seasonal high water table show similar variations. For example, a seasonal high water table is not present for significant periods in the Gallion and Norwood soils. In most years, however, it may be present for significant periods from December through April at a depth of 4 to 6 feet in the Roxana soil and is at progressively shallower depths in the Armistead, Latanier, and Moreland soils.

Similar relationships occur in soils formed in other parent material.

Parent Material and Time

The parent material of mineral soils is the material from which the soil first formed. In the survey area the effects of parent material are particularly expressed in certain differences in soil color, texture, permeability, and depth and degree of leaching. Parent material has also had a major influence on mineralogy of the soils and is a

significant factor in determining their susceptibility to erosion. The characteristics, distribution, and depositional sequence of the parent materials are more thoroughly discussed in the section "Landforms and Surface Geology".

Parent material and time are independent factors of soil formation. For example, a particular kind of parent material may have been exposed to the processes of soil formation for periods ranging from a few years or less to more than a million years. The kinds of horizons and degree of development within a soil are influenced by the length of time of soil formation. Long periods of time are generally required for prominent horizons to form. In the survey area differences in the time of soil formation may amount to thousands of years for some soils.

The soils in Grant Parish formed in parent materials deposited during three or more different geologic time periods. Recent alluvial deposits of the Red River, Little River, and other streams are the parent materials of the youngest soils. The Holocene (Recent) deposits of the Red River are the parent materials of Armistead, Latanier, Gallion, Moreland, Yorktown, Norwood, and Roxana soils. Reddish hues and the presence of free carbonates are prominent characteristics of these sediments at the time of deposition. Roxana, Latanier, Yorktown, Norwood, and Moreland soils formed in the youngest deposits and have undergone only slight leaching in the short period since decomposition. Soil reaction in these soils is neutral or alkaline throughout in places, and free carbonates are present throughout most or all of the solum. The natural fertility level of the surface horizon in these soils is higher than that of other soils in the parish. Roxana soils formed in deposits near the river, and they have more sand than other soils in the flood plain. Norwood soils formed in loamy deposits on natural levees, and Moreland and Yorktown soils formed in clayey backswamp areas. Armistead soils formed in areas where thin layers of more recent clayey sediments were deposited on soils that formed in older loamy deposits.

The Una soils on the flood plains of the Little River, and Cascilla soils on narrow flood plains of streams that drain the terrace uplands formed in recent acid deposits. These sediments are acid because they were eroded from older acid soils of the terrace uplands. Una soils formed in clayey materials,and Cascilla soils formed in loamy materials. Both soils are highly weathered and leached and have an acid soil reaction throughout the solum. They are classified as Inceptisols. No accumulation of translocated clay in the B horizon is evident.

The Gallion soils formed in the oldest Holocene deposits in the area. These soils formed in loamy deposits on natural levees. Gallion soils have developed a B horizon that is more clayey than the surface horizon. These soils are somewhat leached. Soil reaction typically is acid in the surface horizon and becomes more alkaline as depth increases. Gallion soils typically are more acid and have lower natural fertility levels than other soils that formed in more recent Holocene deposits.

Areas of Urbo Variant soils formed mainly in old alluvial deposits of late Pleistocene or early Holocene age along the Little River. These soils formed in loamy deposits on low, convex ridges, and Una soils formed in the clayey, recent alluvial deposits in low areas between the ridges. The Urbo Variant soils have a thin surface layer of more recent loamy alluvium throughout most of the area. In most places soil reaction is less acid in the thin, loamy surface layer than in the underlying horizons.

Areas of Guyton and Cahaba soils are on terraces adjacent to and generally parallel to the present streams that drain the uplands. These soils formed in old alluvium of late Pleistocene or early Holocene age that derived from erosion of the surrounding uplands. Cahaba soils formed in the most sandy sediments eroded from the soils in the uplands. They are at the highest elevations on the stream terraces and are loamy throughout. Guyton soils formed in parent materials having less sand and more silt. Both Cahaba and Guyton soils are highly weathered and leached and are acid throughout the solum. These soils have a B horizon of secondary accumulation of clay. Guyton soils are Alfisols, whereas Cahaba soils that have a lower base status are Ultisols.

These areas of post-Prairie sediments are identified as Deweyville Terrace and are approximately 20,000 years old (*9, 10*). The sediments, which are mostly from surface horizons of surrounding soils, may be low in bases and weatherable minerals at the time of deposition. Because of this, some of the soils that developed in these preweathered materials may have a lower base status and fewer weatherable minerals than many of the soils that developed on the older Prairie Terrace. For example, Cahaba soils are lower in bases and have fewer weatherable minerals than any other soil developed on the Prairie Terrace formation.

Deposits of four Pleistocene terrace formations, the Williana, Bentley, Montgomery, and Prairie Terraces, are the parent materials of soils in the terrace uplands. These soils cover approximately 60 percent of the parish. The two oldest of the Pleistocene terraces, the Williana and Bentley Terraces, formed as a deltaic plain of the Mississippi River (*9, 10*). The sediments of these terraces have been continuously exposed to weathering and soil formation since their deposition more than 300,000 years ago (*25*). Soils that developed in these deposits, mainly Briley, Ruston, Smithdale, and Malbis soils, are highly weathered and leached and are characterized by a distinct B horizon of secondary accumulations of clay. These soils are classified as Ultisols and characteristically have low base status and acid soil reaction throughout. Typically, the base status and soil reaction are highest in the surface horizon and decrease as depth increases into the B horizon. In most

areas the reaction and base status do not increase at greater depths because of the highly weathered and leached condition of the soils. In some areas Briley, Ruston, Smithdale, and Malbis soils formed in deposits that may be of Tertiary age.

Sediments of the Montgomery Terrace formation are intermediate in age between Bentley and Prairie Terraces. These sediments are the parent materials of soils that cover approximately 11 percent of the parish. The parent materials of these soils have been exposed to weathering and soil formation continuously since their deposition more than 100,000 years ago (*25*). Although highly weathered and leached, soils that developed on the Montgomery Terrace, such as Caddo, Guyton, and Glenmora soils, are higher in bases and generally have higher reaction in the lower horizons than the soils that formed on the older Williana and Bentley Terraces. Typically, these soils have base saturation and soil reaction that decrease as depth increases to minimum values in the upper part of the B horizon. In most areas base saturation and soil reaction increase as depth increases in the lower part of the solum. These soils have a distinct B horizon of secondary accumulations of clay and are classified as Alfisols.

The youngest of the four major Pleistocene terrace formations, the Prairie Formation, was deposited as upper deltaic or lower alluvial plains of the Mississippi and Red Rivers. It has been continuously exposed to weathering and soil forming processes since its deposition approximately 30,000 or more years ago (*25*). The terrace deposits of the Prairie Formation are the parent materials of Gore and Kolin soils and cover approximately 8 percent of the parish. These soils are in areas that flank the present Red River alluvial plain. Gore soils formed in reddish clays. Both soils are classified as Alfisols and characteristically have a B horizon that has secondary accumulations of clay. Typically, soil reaction and base saturation decrease as depth increases from the surface horizon to minimum values in the upper part of the B horizon. Below these minimum levels, reaction and base status typically increase as depth increases.

Sediments deposited during the Tertiary period are parent materials of soils in the terrace uplands, such as Cadeville, Kisatchie, Mayhew, Metcalf, Rigolette, Vaiden, and Sumter Variant soils. These soils cover about 16 percent of the parish. The sediments were deposited approximately 15 to 50 million years ago and are the oldest parent materials in the parish. These materials have not been continuously exposed to weathering and soil forming processes since the time of deposition; however, in some places they may have been continuously exposed for periods of more than a million years. Most of the soils formed in Tertiary deposits are highly weathered and leached and characteristically have an acid soil reaction and low base status throughout. Most of the soils have developed a B horizon that is more clayey than the A horizon. The natural fertility of these soils is low throughout the profile. The Sumter Variant soil is the only exception to these statements about the soils that formed in Tertiary age sediments. Sumter Variant soils formed in marly clays. These soils have large amounts of calcium carbonates, are neutral to alkaline throughout, and have not developed a B horizon that is significantly higher in content of clay than the A horizon.

Major differences in the soils that formed in the Tertiary deposits are associated with differences in texture and composition of the parent material. Cadeville, Kisatchie, Mayhew, and Vaiden soils have a B horizon that is more than 35 percent clay in the upper part. Metcalf and Rigolette soils are less clayey in the upper part of the B horizon, but the lower part formed in more clayey sediments. Sumter Variant soils are unique in Grant Parish in that they formed in marly clays and have large amounts of calcium carbonates. Kisatchie soils formed in acid clays overlying soft, tuffaceous sandstone.

Landforms and Surface Geology

Dr. Wayne H. Hudnall, Agronomy Department, Louisiana Agricultural Experiment Station, Louisiana State University, prepared this section.

Grant Parish has two general physiographic regions, the Terrace Uplands and the Flood Plains. Each region is characterized by soils that formed in a different age or kind of parent material. The level to strongly sloping terrace uplands make up about 78 percent of the parish. The level and gently undulating flood plains of the Red River, Little River, and several smaller streams make up the rest of the parish. Elevations range from about 40 feet above sea level on the flood plain of the Red River to about 300 feet on the Terrace Uplands near Williana.

Terrace Uplands

Soils of the Terrace Uplands formed in parent materials deposited during the Tertiary and Quaternary geologic epochs (*9, 10*). The parent materials of these two ages and the soils that formed in these materials are discussed in the following paragraphs.

Tertiary.—An area of nearly level to strongly sloping uplands in the northeastern part of Grant Parish corresponds to the Cadeville-Metcalf and Cadeville-Ruston map units on the General Soil Map. The landscape of these uplands is one of narrow to broad ridgetops and strongly sloping side slopes dissected by numerous small drainageways. The parent materials in the area are dominantly clay, lignitic silts and clays, marly clays, and silty sands of Tertiary age. Some of the ridgetops, however, have a thick mantle of loamy materials of Quaternary age. Tertiary sediments in Grant

Parish are members of the Clairborne, Jackson, and Vicksburg Groups (*9, 10*).

Cadeville soils, which formed in the clayey sediments, make up about 72 percent of the area. These gently sloping to strongly sloping soils are on ridgetops and side slopes. Metcalf soils, which formed in loamy material overlying clayey sediments at a depth of 30 to 40 inches, make up about 13 percent of the area. They are on broad, nearly level ridgetops. Ruston soils, which formed in loamy materials of Quaternary age, make up about 10 percent of the area. They are on narrow ridgetops. Of minor extent are the Guyton soils in drainageways and several other soils, such as the Briley, Glenmora, and Malbis soils, on uplands. They make up 5 percent of the area.

An area of hilly uplands 2 miles north of Colfax corresponds to the Rigolette-Kisatchie map unit on the General Soil Map. The parent materials of the soils in this area are mainly clays, shales, green sandy shales, and clayey sands. These sediments, which are members of the Catahoula Formation within the Grant Gulf Group (*9, 10*) are capped in places by sandy and loamy sediments of Quaternary age.

Rigolette soils, which formed in these loamy and sandy materials overlying the clayey sediments of the Catahoula Formation, make up about 38 percent of the area. They are on the upper and middle parts of side slopes. Kisatchie soils, which formed in gray clay overlying soft, tuffaceous sandstone of the Catahoula Formation, make up 32 percent of the area. They are mainly on the steeper, convex side slopes. Several soils of minor extent, such as the Briley, Cadeville, and Smithdale soils, make up 30 percent of the area.

The topography of the uplands in the Tertiary sediments appears to have developed mainly as a result of differential erosion of the various horizontally bedded formations of Tertiary age. Tectonics (folding and faulting) may also have contributed to some extent to the development of this topography.

Quaternary.—In Grant Parish the surface geology of the terrace uplands of the Quaternary system are deposits of the Pleistocene series (*9, 10*). These sediments were deposited as a result of braided stream terrace deposits from the Mississippi and Red River systems. Early geological maps of Grant Parish divided the Pleistocene according to the different interglacial periods and terrace deposits associated with these periods (*9, 10*). From oldest to youngest, these terraces are the Williana, Bentley, Montgomery, and Prairie Terraces. More recent geological literature refers to the Williana and Bentley Terraces as one formation and identify it as the Citronelle Formation (*16*). Investigations made during this survey showed few differences in the parent materials of soils formed in the Williana and Bentley Terraces; therefore, the same soils were mapped on both terraces. According to R. T. Saucier (*25*), the Citronelle age sediments were deposited approximately 300,000 to 1,000,000 years ago.

Areas of the Williana and Bentley Terraces, or Citronelle Formation, cover about 43 percent of the parish and, except for areas of the Glenmora soil, correspond to the Malbis-Glenmora and Smithdale-Ruston map units on the General Soil Map (*9, 10*). Glenmora soils are on areas of the lower lying Montgomery Terrace but are included with Malbis soils on the General Soil Map because of the close association of soils and terraces and the small scale of the map.

Ruston soils are on narrow ridgetops, and Smithdale soils are on steeper side slopes. Both of these well drained soils are reddish and loamy throughout. Malbis soils are at a slightly lower elevation than Ruston soils, and they are on somewhat broader ridgetops. The moderately well drained Malbis soils are brownish and loamy throughout.

The topography of the Williana and Bentley Terraces is one of narrow, gently sloping ridgetops and strongly sloping side slopes dissected by numerous small drainageways.

Areas of the Montgomery Terrace cover about 11 percent of the parish and generally correspond to the Caddo-Glenmora-Guyton map unit on the General Soil Map (*9, 10*). The Montgomery Terrace is at a lower elevation than the Williana and Bentley Terraces, and it is less dissected and has less relief. According to H. T. Saucier (*25*), the Montgomery age sediments were deposited approximately 100,000 to 300,000 years ago.

The poorly drained Caddo and Guyton soils are on broad flats and in depressional areas. These soils formed in loamy materials. In these areas Guyton soils formed in sediments of Montgomery age; however, as discussed later in this section, the Guyton soils also formed in younger sediments in a different part of the parish. The moderately well drained Glenmora soils are at a higher elevation than Caddo and Guyton soils. They formed in loamy materials overlying clayey materials at a depth of about 50 to 60 inches.

Areas of the Prairie Terrace (*9, 10*) cover about 8 percent of the parish and correspond to the Gore-Kolin map unit on the General Soil Map. The Prairie Terrace flanks the alluvial plains of the Red River, Little River, and some other major streams in the parish. This terrace is discontinuous and relatively undissected. Slopes are dominantly less than 3 percent; slopes that are more than 5 percent are restricted almost entirely to the valley walls of drainage systems and to escarpments separating the Prairie Terrace from other areas. According to H. T. Saucier (*25*), the Prairie age sediments were deposited approximately 30,000 to 100,000 years ago. Investigations made during the survey, however, indicated that these sediments in Grant Parish may be slightly older than Prairie age and younger

than Montgomery age and possibly represent a separate, unnamed stratigraphic unit.

Gore soils are on gently sloping interstream divides and strongly sloping valley walls and escarpments. They formed in reddish clays deposited by the Red River when the river followed a course that was mostly east of its present location in Grant Parish. Kolin soils are on broad flats. They formed in loamy material overlying reddish clay.

Flood Plains

Recent Red River alluvial deposits cover about 11 percent of the parish and correspond to the Moreland-Armistead-Latanier and Roxana-Gallion-Norwood map units on the General Soil Map. The Red River flood plain forms a nearly continuous northwest to southeast band along the western edge of the parish. It is bounded on the west by the Red River and on the east by a low to high bluff line that separates it from the Terrace Uplands. Except for small areas of ridges and swales, level topography is characteristic of the entire area. The sediments of the Red River flood plain are dominantly materials derived from erosion of the older Permean red beds to the north and west of Grant Parish and transported by the Red River.

Sediments in the area are recent in age (*9, 10*) and most of them are considerably younger than the approximately 10,000 years that mark the beginning of Holocene (Recent) time. Soils that formed in parent materials of at least two different ages are mapped in this area. The Gallion soils formed in the oldest deposits on natural levees in an area that is not covered by more recent sediments. These soils are loamy throughout. Armistead soils also formed in these oldest deposits on natural levees. They are loamy but are covered by 10 to 20 inches of more recent clayey sediments.

The Latanier, Moreland, Norwood, and Roxana soils formed entirely in more recent sediments. Roxana soils, which are on the highest parts of the natural levee near the river, have more sand and less clay than Latanier, Moreland, and Norwood soils. Norwood soils, which are on the natural levee farther from the river, formed in loamy deposits and have less sand and more silt and clay than Roxana soils. Latanier soils, which are on the lower parts of natural levees, formed in clayey deposits overlying loamy deposits. Moreland soils, which formed in clayey backswamp deposits, are clayey throughout. In places buried soils that formed in older Holocene deposits may underlie the Moreland, Latanier, and Norwood soils below a depth of 40 inches.

Alluvial deposits of the Little River flood plain cover about 2 percent of the parish and correspond to the Una-Urbo Variant map unit on the General Soil Map. The Little River flood plain forms a nearly continuous north-south band along the eastern edge of the parish. It is bounded on the east by the Little River and on the west by a low to high bluff line that separates it from the Terrace Uplands.

The Una soils are on broad flats and in depressional areas, and Urbo Variant soils are on low stream terraces that appear as mounds and ridges within broad areas of Una soils. Both soils are subject to flooding from stream overflow and are continuously covered with additional increments of recent alluvium. Urbo Variant soils formed partly in recent loamy sediments and partly in the older underlying loamy sediments of Prairie or Deweyville age. The sediments of Prairie or Deweyville age were deposited on these soils as a result of braided or terrace deposits from a former river system. Una soils formed entirely in recent clayey sediments.

Recent sediments of the Little River flood plain derive mainly from erosion of local soil materials within Grant Parish and from parishes to the north. Some of the clayey sediments on the flood plain in the southern part of Grant Parish and in adjoining Rapides Parish are derived from backwater deposits of a former channel of the Mississippi River.

Undifferentiated alluvial deposits of recent age are on the narrow flood plains of numerous small streams in Grant Parish. These recent deposits cover about 9 percent of the parish and correspond to the Guyton-Cascilla map unit on the General Soil Map.

The Cascilla soils formed in recent loamy deposits that are derived entirely from erosion of local soil materials, and Guyton soils formed in older deposits of late Pleistocene age. In many places the Guyton soils are buried beneath deposits that are the parent materials of the Cascilla soils. Both Cascilla and Guyton soils are subject to frequent flooding and additions of loamy materials washed from the Terrace Uplands. The poorly drained Guyton soils are in low positions on the flood plain, and the well drained Cascilla soils are on higher positions on ridges and natural levees of the streams.

Small areas of the Cahaba soils are included in most of the map units of the flood plains on the General Soil Map. Cahaba soils are on low stream terraces that occur as narrow, discontinous bands which flank the flood plains of some of the major streams in the parish. These terraces are mostly stream deposits of sediments from late Pleistocene age and are approximately 10,000 to 30,000 years old. They are the result of erosion from the surrounding uplands and are known as the Deweyville Terraces (*9, 10*). The well drained Cahaba soils formed in reddish, loamy and sandy sediments. The poorly drained Guyton soils, which are also mapped on some of the low stream terraces in the parish, are on flats and in depressional areas. They formed in grayish, loamy sediments and are also considered to be of late Pleistocene age.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coefficient of linear extensibility (COLE). A quantitative method of determining shrink-swell behavior of soil. It is an estimate of the vertical component of swelling of a natural soil clod. COLE is expressed as low (0.0-0.3); moderate (0.03-0.06); and high (0.06-0.09).

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can

be removed only by percolation or evapotranspiration.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1952-77 at Belah, Louisiana]

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average daily	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days[1]	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	57.3	36.0	46.7	80	13	79	4.51	2.34	6.29	7	.5
February---	62.1	38.9	50.5	81	19	133	4.94	2.78	6.69	7	.6
March------	69.2	45.9	57.6	86	25	277	5.85	2.85	8.30	7	.2
April------	78.1	55.4	66.8	89	34	504	5.54	2.07	8.32	6	.0
May--------	84.3	61.9	73.1	95	45	716	6.08	2.99	8.60	7	.0
June-------	90.8	67.9	79.3	99	54	879	3.51	1.25	5.32	6	.0
July-------	93.3	70.6	82.0	102	61	992	5.38	2.99	7.33	8	.0
August-----	93.1	69.4	81.3	101	58	970	4.21	1.83	6.13	7	.0
September--	88.9	65.3	77.2	98	48	816	4.02	1.49	6.05	6	.0
October----	80.0	53.7	66.8	94	33	521	3.55	1.05	5.56	4	.0
November---	68.6	44.6	56.6	86	23	223	4.37	1.81	6.44	6	.0
December---	60.5	38.3	49.4	79	16	103	6.20	3.48	8.40	8	.0
Yearly:											
Average--	77.2	54.0	65.6	---	---	---	---	---	---	---	---
Extreme--	---	---	---	103	13	---	---	---	---	---	---
Total----	---	---	---	---	---	6,213	58.16	47.62	68.18	79	1.3

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1952-77 at Belah, Louisiana]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 13	March 22	March 29
2 years in 10 later than--	March 2	March 14	March 23
5 years in 10 later than--	February 10	February 28	March 13
First freezing temperature in fall:			
1 year in 10 earlier than--	November 15	November 4	October 26
2 years in 10 earlier than--	November 24	November 11	October 31
5 years in 10 earlier than--	December 11	November 25	November 9

TABLE 3.--GROWING SEASON

[Recorded in the period 1952-77 at Belah, Louisiana]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	271	239	217
8 years in 10	282	249	225
5 years in 10	303	269	241
2 years in 10	324	289	256
1 year in 10	335	300	264

TABLE 4.--SUITABILITY AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP FOR SPECIFIED USES

Map unit	Percent of area	Cultivated crops	Pasture	Woodland	Urbar
1. Malbis-Glenmora----------	12	Well suited-----------	Well suited--------	Well suited-------	Moderate suited: wetnes slow a permea
2. Caddo-Glenmora-Guyton----	11	Moderately well suited: wetness, slope.	Well suited--------	Well suited-------	Poorly s wetnes permea
3. Gore-Kolin---------------	8	Poorly suited: slope.	Moderately well suited: slope.	Moderately well suited: wetness, clayey subsoil.	Poorly s wetne permea shrink
4. Cadeville-Metcalf--------	8	Poorly suited: slope, wetness.	Moderately well suited: slope.	Moderately well suited: wetness, clayey subsoil.	Poorly very shrink slope
5. Smithdale-Ruston---------	31	Poorly suited: slope.	Well suited--------	Well suited-------	Moderate suited: slope
6. Cadeville-Ruston---------	7	Poorly suited: slope.	Moderately well suited: slope.	Moderately well suited: clayey subsoil.	Poorly slope moder perme
7. Rigolette-Kisatchie------	1	Poorly suited: slope, rock outcrops.	Poorly suited: slope, rock outcrops.	Poorly suited: slope, shallow rooting zone, rock outcrops.	Poorly slope shrin slow wetne
8. Guyton-Cascilla----------	9	Poorly suited: wetness, flooding.	Moderately well suited: wetness, flooding.	Moderately well suited: wetness, flooding.	Not sui wetne
9. Moreland-Armistead-Latanier-----------------	6	Moderately well suited: wetness, poor tilth.	Well suited--------	Well suited-------	Poorly wetne shrin and v perme
10. Roxana-Gallion-Norwood---	5	Well suited-----------	Well suited--------	Well suited-------	Moderat moder shrin
11. Una-Urbo Variant---------	2	Poorly suited: wetness, flooding.	Poorly suited: wetness, flooding.	Moderately well suited: wetness, flooding.	Not sui wetne

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ad	Armistead clay	3,193	0.8
Br	Briley loamy fine sand, 5 to 12 percent slopes	1,716	0.4
Ca	Caddo silt loam	20,548	4.9
Cd	Cadeville very fine sandy loam, 2 to 5 percent slopes	13,549	3.2
Ce	Cadeville very fine sandy loam, 5 to 12 percent slopes	31,293	7.4
Ch	Cahaba fine sandy loam, 1 to 3 percent slopes	1,362	0.3
Ga	Gallion silt loam	4,515	1.1
Gb	Gallion silty clay loam	3,300	0.8
Gc	Gallion silt loam, occasionally flooded	387	*
Gn	Glenmora silt loam, 1 to 3 percent slopes	30,351	7.1
Go	Gore silt loam, 1 to 5 percent slopes	6,681	1.6
Gr	Gore silt loam, 5 to 12 percent slopes	15,280	3.6
Gu	Guyton silt loam	7,975	1.9
GY	Guyton and Cascilla soils, frequently flooded	44,409	10.5
Ko	Kolin silt loam, 1 to 3 percent slopes	6,299	1.5
La	Latanier clay	2,971	0.6
Ma	Malbis fine sandy loam, 1 to 5 percent slopes	33,754	8.0
Me	Mayhew silty clay loam	2,601	0.6
Mf	Metcalf very fine sandy loam	8,276	2.0
Mn	Moreland silt loam, overwash	1,519	0.4
Mo	Moreland silty clay loam	3,315	0.8
Mr	Moreland clay	6,625	1.6
Mt	Moreland clay, gently undulating	2,844	0.7
Mw	Moreland clay, occasionally flooded	2,992	0.7
Nd	Norwood silt loam	2,700	0.6
No	Norwood silty clay loam	1,103	0.3
Nr	Norwood silt loam, gently undulating	1,145	0.3
Pt	Pits, gravel	973	0.2
RK	Rigolette-Kisatchie association, hilly	4,662	1.1
Rm	Roxana very fine sandy loam	2,211	0.5
Rn	Roxana very fine sandy loam, occasionally flooded	2,783	0.6
Ro	Roxana very fine sandy loam, frequently flooded	3,491	0.8
Rp	Ruston fine sandy loam, 1 to 5 percent slopes	56,222	13.2
RR	Ruston-Cadeville association, moderately rolling	4,321	1.0
RS	Ruston-Smithdale association, moderately rolling	13,273	3.1
Sm	Smithdale fine sandy loam, 5 to 12 percent slopes	58,255	13.7
St	Sumter Variant silty clay loam, 1 to 5 percent slopes	112	*
Un	Una silty clay, frequently flooded	7,369	1.7
Uo	Urbo Variant silty clay loam, occasionally flooded	1,722	0.4
Va	Vaiden silty clay, 1 to 5 percent slopes	200	*
Yo	Yorktown silty clay	780	0.2
	Small water areas	625	0.1
	Large water areas	7,232	1.7
	Total	424,934	100.0

* Less than 0.1 percent.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield figure indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Corn	Cotton lint	Soybeans	Common bermudagrass	Improved bermudagrass	Bahiagrass
	Bu	Lbs	Bu	AUM*	AUM*	AUM*
Ad------------------------- Armistead	---	675	35	6.0	12.0	8.5
Br------------------------- Briley	40	275	20	---	8.0	4.0
Ca------------------------- Caddo	60	---	24	5.0	---	6.5
Cd------------------------- Cadeville	45	---	22	4.5	7.5	5.0
Ce------------------------- Cadeville	---	---	---	4.0	6.5	4.0
Ch------------------------- Cahaba	85	750	30	6.0	9.5	5.5
Ga------------------------- Gallion	90	875	40	7.0	15.0	9.5
Gb------------------------- Gallion	85	825	40	7.0	13.0	9.5
Gc------------------------- Gallion	80	800	35	7.0	12.5	9.0
Gn------------------------- Glenmora	70	550	30	5.0	9.5	7.0
Go------------------------- Gore	45	---	23	4.5	7.5	5.5
Gr------------------------- Gore	---	---	---	4.0	7.0	4.5
Gu------------------------- Guyton	55	---	23	5.5	---	6.0
GY------------------------- Guyton and Cascilla	---	---	---	4.5	---	---
Ko------------------------- Kolin	60	---	30	5.5	11.0	7.5
La------------------------- Latanier	---	---	37	6.0	12.0	---
Ma------------------------- Malbis	70	550	30	5.0	9.5	7.5
Me------------------------- Mayhew	---	---	24	4.5	10.0	6.0
Mf------------------------- Metcalf	60	---	30	5.0	11.0	7.0
Mn, Mo, Mr----------------- Moreland	---	---	35	6.0	12.0	---
Mt------------------------- Moreland	---	---	33	5.5	11.0	---

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Cotton lint	Soybeans	Common bermudagrass	Improved bermudagrass	Bahiagrass
	Bu	Lbs	Bu	AUM*	AUM*	AUM*
Mw------------------------ Moreland	---	---	30	5.5	---	---
Nd, No-------------------- Norwood	90	875	40	8.5	15.5	9.0
Nr------------------------ Norwood	85	850	35	8.0	14.0	8.0
Pt**. Pits						
RK**:						
Rigolette-----------------	---	---	---	4.0	---	5.0
Kisatchie-----------------	---	---	---	3.5	---	4.0
Rm------------------------ Roxana	85	850	35	8.5	15.5	8.5
Rn------------------------ Roxana	---	---	35	8.5	15.0	---
Ro------------------------ Roxana	---	---	---	6.0	---	---
Rp------------------------ Ruston	65	600	25	5.5	10.0	7.0
RR**:						
Ruston--------------------	---	---	---	---	---	---
Cadeville-----------------	---	---	---	---	---	---
RS**:						
Ruston--------------------	---	---	---	---	---	---
Smithdale-----------------	---	---	---	---	---	---
Sm------------------------ Smithdale	---	---	---	5.0	9.0	6.0
St------------------------ Sumter Variant	---	---	---	---	---	5.0
Un------------------------ Una	---	---	---	4.0	---	---
Uo------------------------ Urbo Variant	---	---	---	4.5	---	---
Va------------------------ Vaiden	40	---	25	---	---	6.5
Yo------------------------ Yorktown	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
I	9,426	---	---	---
II	92,553	73,511	19,042	---
III	105,432	56,834	48,598	---
IV	103,709	98,995	4,714	---
V	55,980	---	55,980	---
VI	51,935	51,935	---	---
VII	1,753	---	780	973
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Ad------------------ Armistead	2w	Slight	Moderate	Moderate	Green ash------------	80	Eastern cottonwood, American sycamore.
					Cherrybark oak-------	90	
					Water oak------------	90	
					Pecan----------------	---	
					Sweetgum-------------	90	
					American sycamore----	---	
					Eastern cottonwood---	110	
Br------------------ Briley	3s	Slight	Slight	Moderate	Loblolly pine--------	80	Loblolly pine, slash pine.
					Shortleaf pine-------	70	
					Slash pine-----------	---	
Ca------------------ Caddo	2w	Slight	Severe	Moderate	Loblolly pine--------	95	Loblolly pine.
					Sweetgum-------------	---	
					Water oak------------	---	
Cd, Ce-------------- Cadeville	3c	Slight	Severe	Moderate	Loblolly pine--------	80	Loblolly pine, slash pine.
					Shortleaf pine-------	70	
Ch------------------ Cahaba	2o	Slight	Slight	Slight	Loblolly pine--------	87	Loblolly pine, slash pine, yellow-poplar, sweetgum.
					Slash pine-----------	91	
					Yellow-poplar--------	---	
					Sweetgum-------------	90	
Ga, Gb, Gc---------- Gallion	2o	Slight	Slight	Slight	Green ash------------	80	Eastern cottonwood, American sycamore.
					Cherrybark oak-------	95	
					Sweetgum-------------	83	
					Water oak------------	---	
					Pecan----------------	---	
					American sycamore----	---	
					Eastern cottonwood---	100	
Gn------------------ Glenmora	2w	Slight	Moderate	Slight	Loblolly pine--------	93	Loblolly pine, slash pine.
					Slash pine-----------	---	
					Longleaf pine--------	---	
					Sweetgum-------------	---	
					Water oak------------	---	
					Cherrybark oak-------	---	
Go, Gr-------------- Gore	3c	Slight	Moderate	Moderate	Loblolly pine--------	76	Loblolly pine.
					Shortleaf pine-------	---	
Gu------------------ Guyton	2w	Slight	Severe	Moderate	Loblolly pine--------	90	Loblolly pine, sweetgum.
					Slash pine-----------	90	
					Sweetgum-------------	---	
					Green ash------------	---	
					Southern red oak-----	---	
					Water oak------------	---	
GY*:							
Guyton--------------	2w	Slight	Severe	Moderate	Loblolly pine--------	90	Loblolly pine, sweetgum.
					Slash pine-----------	90	
					Sweetgum-------------	---	
					Green ash------------	---	
					Southern red oak-----	---	
					Water oak------------	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

		Management concerns			Potential productivity		
Map symbol and soil name	Ordination symbol	Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	Trees to plant
GY*:							
Cascilla	1w	Slight	Moderate	Moderate	Cherrybark oak	112	Cherrybark oak, eastern cottonwood, loblolly pine, Nuttall oak, sweetgum, American sycamore, yellow-poplar.
					Eastern cottonwood	110	
					Loblolly pine	93	
					Nuttall oak	114	
					Water oak	104	
					Sweetgum	102	
					Yellow-poplar	115	
Ko: Kolin	3w	Slight	Moderate	Slight	Loblolly pine	80	Loblolly pine.
					Shortleaf pine	---	
La: Latanier	2w	Slight	Moderate	Moderate	Green ash	80	Eastern cottonwood, American sycamore.
					Cherrybark oak	90	
					Water oak	90	
					Pecan	---	
					Sweetgum	90	
					Eastern cottonwood	110	
					American sycamore	---	
					Sugarberry	---	
Ma: Malbis	2o	Slight	Slight	Slight	Loblolly pine	90	Loblolly pine, slash pine.
					Slash pine	90	
					Longleaf pine	80	
Me: Mayhew	2w	Slight	Severe	Slight	Water oak	80	Loblolly pine, slash pine, sweetgum.
					White oak	---	
					Loblolly pine	90	
					Sweetgum	90	
Mf: Metcalf	2w	Slight	Moderate	Slight	Loblolly pine	92	Loblolly pine.
					Shortleaf pine	74	
					Sweetgum	---	
Mn, Mo, Mr, Mt: Moreland	2w	Slight	Severe	Moderate	Green ash	75	Eastern cottonwood, American sycamore.
					Eastern cottonwood	100	
					Sweetgum	90	
					American sycamore	---	
					Water oak	90	
					Cherrybark oak	90	
					Sugarberry	---	
Mw: Moreland	3w	Slight	Severe	Severe	Green ash	70	Eastern cottonwood, American sycamore.
					Eastern cottonwood	90	
					Sweetgum	80	
					Water oak	80	
					Cherrybark oak	80	
Nd, No, Nr: Norwood	1o	Slight	Slight	Slight	Eastern cottonwood	100	Eastern cottonwood. American sycamore, sweetgum.
					Sugarberry	---	
RK*:							
Rigolette	5d	Moderate	Moderate	Moderate	Loblolly pine	50	Loblolly pine.
					Shortleaf pine	50	
Kisatchie	5d	Moderate	Moderate	Moderate	Loblolly pine	50	Loblolly pine.
					Shortleaf pine	45	
Rm, Rn, Ro: Roxana	1o	Slight	Slight	Slight	Eastern cottonwood	115	Eastern cottonwood, American sycamore.
					Sweetgum	100	
					Pecan	---	
					American sycamore	---	
					Water oak	---	
					Cherrybark oak	---	
					Sugarberry	---	
Rp: Ruston	2o	Slight	Slight	Slight	Loblolly pine	91	Loblolly pine, slash pine, longleaf pine.
					Slash pine	91	
					Longleaf pine	76	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
RR*,**:							
Ruston	2o	Slight	Severe	Slight	Loblolly pine	91	Loblolly pine, slash pine, longleaf pine.
					Slash pine	91	
					Longlear pine	76	
Cadeville	3c	Slight	Severe	Moderate	Loblolly pine	80	Loblolly pine, slash pine.
					Shortleaf pine	70	
RS*,**:							
Ruston	2o	Slight	Severe	Slight	Loblolly pine	91	Loblolly pine, slash pine, longleaf pine.
					Slash pine	91	
					Longleaf pine	76	
Smithdale	2o	Slight	Severe	Slight	Loblolly pine	86	Loblolly pine, slash pine, longleaf pine.
					Slash pine	85	
					Longleaf pine	69	
Sm: Smithdale	2o	Slight	Slight	Slight	Loblolly pine	86	Loblolly pine, pine pine, longleaf pine.
					Slash pine	85	
					Longleaf pine	69	
St: Sumter Variant	4c	Moderate	Moderate	Moderate	Eastern redcedar	37	Eastern redcedar.
Un: Una	2w	Slight	Moderate	Severe	Sweetgum	90	Sweetgum, green ash, Nuttall oak, water tupelo, baldcypress.
					Eastern cottonwood	85	
					Green ash	75	
					Cherrybark oak	90	
					Nuttall oak	95	
					Water oak	90	
					Willow oak	90	
					Water tupelo	80	
					Baldcypress	---	
Uo: Urbo Variant	3w	Slight	Moderate	Slight	Cherrybark oak	80	Green ash, baldcypress, eastern cottonwood, Nuttall oak, willow oak, sweetgum, American sycamore.
					Nuttall oak	80	
					Water oak	80	
					Water hickory	---	
					Eastern cottonwood	90	
					Common persimmon	---	
					Honeylocust	---	
					Baldcypress	---	
					Willow oak	---	
Va: Vaiden	3c	Slight	Moderate	Moderate	Loblolly pine	79	Loblolly pine, eastern redcedar.
					Shortleaf pine	66	
					Eastern redcedar	45	
					Southern red oak	70	
Yo: Yorktown	4w	Slight	Severe	Severe	Baldcypress	70	Baldcypress, green ash, water tupelo.
					Water tupelo	---	
					Water hickory	---	
					Green ash	---	

* See description of the map unit for composition and behavior characteristics of the map unit.

** Ratings are severe because soil areas are within a military bombing range site.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ad------------------- Armistead	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Br------------------- Briley	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
Ca------------------- Caddo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Cd------------------- Cadeville	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
Ce------------------- Cadeville	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
Ch------------------- Cahaba	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
Ga------------------- Gallion	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
Gb------------------- Gallion	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
Gc------------------- Gallion	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
Gn------------------- Glenmora	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
Go------------------- Gore	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
Gr------------------- Gore	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
Gu------------------- Guyton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
GY*:					
Guyton-------------	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Cascilla-------------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Ko------------------- Kolin	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight----------	Moderate: wetness.
La------------------- Latanier	Severe: wetness, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: too clayey.	Severe: too clayey.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ma: Malbis	Slight	Slight	Moderate: slope.	Slight	Slight.
Me: Mayhew	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Mf: Metcalf	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
Mn, Mo: Moreland	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Mr, Mt, Mw: Moreland	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
Nd, No: Norwood	Slight	Slight	Slight	Slight	Slight.
Nr: Norwood	Slight	Slight	Moderate: slope.	Slight	Slight.
Pt*. Pits					
RK*:					
Rigolette	Severe: wetness, percs slowly.	Severe: percs slowly, wetness.	Severe: slope, wetness, percs slowly.	Severe: wetness.	Moderate: wetness, droughty, slope.
Kisatchie	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
Rm: Roxana	Slight	Slight	Slight	Slight	Slight.
Rn: Roxana	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Ro: Roxana	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Rp: Ruston	Slight	Slight	Moderate: slope.	Slight	Slight.
RR*, **:					
Ruston	Severe	Severe	Severe	Severe	Severe.
Cadeville	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe.
RS*, **:					
Ruston	Severe	Severe	Severe	Severe	Severe.

See footnotes at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RS*, **:					
Smithdale	Severe	Severe	Severe	Severe	Severe.
Sm Smithdale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
St Sumter Variant	Moderate: percs slowly.	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
Un Una	Severe: flooding, wetness, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.	Severe: wetness, flooding, too clayey.
Uo Urbo Variant	Severe: wetness, flooding.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, flooding.
Va Vaiden	Severe: wetness, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: too clayey.	Severe: too clayey.
Yo Yorktown	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, excess humus.	Severe: too clayey, excess humus, ponding.	Severe: ponding, too clayey, excess humus.	Severe: ponding, flooding, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

** Ratings are severe because soil areas are within a military bombing range site.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Ad: Armistead	Fair	Fair	Fair	Good	---	Good	Good	Fair	Fair	Good	Fair.
Br: Briley	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ca: Caddo	Fair	Fair	Fair	Fair	Good	Fair	Good	Good	Fair	Fair	Good.
Cd: Cadeville	Fair	Good	Good	Poor	Good	Fair	Poor	Very poor.	Good	Good	Very poor.
Ce: Cadeville	Fair	Good	Good	Poor	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.
Ch: Cahaba	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ga, Gb: Gallion	Good	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.
Gc: Gallion	Good	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.
Gn: Glenmora	Good	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
Go, Gr: Gore	Poor	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Gu: Guyton	Fair	Fair	Fair	Fair	Good	Fair	Good	Good	Fair	Fair	Good.
GY*:											
Guyton	Poor	Fair	Fair	Fair	Good	Fair	Good	Good	Poor	Fair	Good.
Cascilla	Poor	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Ko: Kolin	Good	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
La: Latanier	Fair	Fair	Fair	Good	---	Good	Good	Good	Fair	Good	Good.
Ma: Malbis	Good	Good	Good	Fair	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Me: Mayhew	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Mf: Metcalf	Fair	Good	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Mn, Mo, Mr, Mt: Moreland	Fair	Fair	Fair	Good	---	Good	Good	Good	Fair	Good	Good.
Mw: Moreland	Fair	Fair	Fair	Good	---	Good	Good	Good	Fair	Good	Good.
Nd, No: Norwood	Good	Good	Fair	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Nr------------------ Norwood	Fair	Good	Fair	Good	---	Fair	Poor	Very poor.	Fair	Good	Very poor.
Pt*. Pits											
RK*:											
Rigolette----------	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Kisatchie----------	Poor	Fair	Fair	Poor	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Rm------------------ Roxana	Good	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.
Rn------------------ Roxana	Good	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.
Ro------------------ Roxana	Poor	Fair	Fair	Good	---	Good	Poor	Very poor.	Fair	Good	Very poor.
Rp------------------ Ruston	Good	Good	Good	Fair	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RR*,**:											
Ruston-------------	Very poor.	Very poor.	Good	Fair	Good	Good	Poor	Very poor.	Very poor.	Good	Very poor.
Cadeville----------	Very poor.	Very poor.	Good	Poor	Good	Fair	Very poor.	Very poor.	Very poor.	Good	Very poor.
RS*,**:											
Ruston-------------	Very poor.	Very poor.	Good	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
Smithdale----------	Very poor.	Very poor.	Good	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
Sm------------------ Smithdale	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
St------------------ Sumter Variant	Fair	Fair	Fair	Fair	Poor	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Un------------------ Una	Poor	Fair	Fair	Fair	---	Fair	Good	Good	Fair	Fair	Good.
Uo------------------ Urbo Variant	Poor	Fair	Fair	Fair	---	Fair	Fair	Fair	Poor	Fair	Fair.
Va------------------ Vaiden	Fair	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Yo------------------ Yorktown	Very poor.	Very poor.	Very poor.	Poor	Poor	Poor	Poor	Good	Very poor.	Very poor.	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

** Ratings are very poor because soil areas are within a military bombing range site.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ad: Armistead	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Severe: too clayey.
Br: Briley	Severe: cutbanks cave.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Ca: Caddo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Cd: Cadeville	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Ce: Cadeville	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
Ch: Cahaba	Slight	Slight	Slight	Slight	Slight.
Ga, Gb: Gallion	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Gc: Gallion	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
Gn: Glenmora	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: low strength.	Slight.
Go: Gore	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Gr: Gore	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
Gu: Guyton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
GY*:					
Guyton	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Cascilla	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
Ko: Kolin	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
La: Latanier	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ma: Malbis	Moderate: wetness.	Slight	Slight	Moderate: low strength.	Slight.
Me: Mayhew	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness.
Mf: Metcalf	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
Mn, Mo: Moreland	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness.	Severe: wetness.
Mr, Mt: Moreland	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness.	Severe: wetness, too clayey.
Mw: Moreland	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, too clayey.
Nd, No, Nr: Norwood	Slight	Slight	Slight	Severe: low strength.	Slight.
Pt*. Pits					
RK*:					
Rigolette	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Severe: wetness.	Moderate: wetness, droughty. slope.
Kisatchie	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Rm: Roxana	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Rn: Roxana	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Ro: Roxana	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Rp: Ruston	Slight	Slight	Slight	Moderate: low strength.	Slight.
RR*,**:					
Ruston	Severe	Severe	Severe	Severe	Severe.
Cadeville	Severe	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe.
RS*,**:					
Ruston	Severe	Severe	Severe	Severe	Severe.

See footnotes at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
RS*,**:					
Smithdale	Slight	Slight	Moderate: slope.	Slight	Slight.
Sm Smithdale	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
St Sumter Variant	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe low strength, shrink-swell.	Slight.
Un Una	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding, too clayey.
Uo Urbo Variant	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: low strength, flooding.	Moderate: wetness, flooding.
Va Vaiden	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Yo Yorktown	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

** Ratings are severe because soil areas are within a military bombing range site.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ad------------------- Armistead	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Br------------------- Briley	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: seepage.	Fair: slope.
Ca------------------- Caddo	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Cd------------------- Cadeville	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Ce------------------- Cadeville	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Ch------------------- Cahaba	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Fair: thin layer.
Ga, Gb--------------- Gallion	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Gc------------------- Gallion	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Gn------------------- Glenmora	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Go------------------- Gore	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Gr------------------- Gore	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Gu------------------- Guyton	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
GY*:					
Guyton--------------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Cascilla------------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Ko------------------- Kolin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
La------------------- Latanier	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ma------------------ Malbis	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
Me------------------ Mayhew	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Mf------------------ Metcalf	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Poor: thin layer.
Mn, Mo, Mr, Mt------ Moreland	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Mw------------------ Moreland	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Nd, No-------------- Norwood	Moderate: percs slowly.	Moderate: seepage	Moderate: too clayey	Slight-----------	Fair: too clayey.
Nr------------------ Norwood	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Pt*. Pits					
RK*:					
Rigolette----------	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
Kisatchie----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rm------------------ Roxana	Moderate: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Moderate: wetness.	Fair: thin layer.
Rn, Ro-------------- Roxana	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: thin layer.
Rp------------------ Ruston	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
RR*,**:					
Ruston-------------	Severe-----------	Severe-----------	Severe-----------	Severe-----------	Poor.
Cadeville----------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Severe-----------	Poor: too clayey, hard to pack.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RS*,**:					
Ruston	Severe	Severe	Severe	Severe	Poor.
Smithdale	Severe	Severe: seepage.	Severe	Severe: seepage.	Poor.
Sm: Smithdale	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
St: Sumter Variant	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Un: Una	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Uo: Urbo Variant	Severe: wetness, percs slowly, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Poor: hard to pack, wetness.
Va: Vaiden	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Yo: Yorktown	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

** Ratings are severe because soil areas are within a military bombing range site.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Ad-------------------- Armistead	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Br-------------------- Briley	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, slope.
Ca-------------------- Caddo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Cd, Ce---------------- Cadeville	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ch-------------------- Cahaba	Good:	Improbable: excess fines.	Improbable: excess fines.	Good.
Ga-------------------- Gallion	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gb-------------------- Gallion	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Gc-------------------- Gallion	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gn-------------------- Glenmora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Go, Gr---------------- Gore	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Gu-------------------- Guyton	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
GY*:				
Guyton---------------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Cascilla-------------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ko-------------------- Kolin	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
La-------------------- Latanier	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Ma-------------------- Malbis	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Me-------------------- Mayhew	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Mf-------------------- Metcalf	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Mn, Mo: Moreland	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mr, Mt, Mw: Moreland	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Nd: Norwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
No: Norwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Nr: Norwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pt*. Pits				
RK*:				
Rigolette	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, thin layer, slope.
Kisatchie	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Rm, Rn, Ro: Roxana	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
Rp: Ruston	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RR*,**:				
Ruston	Poor	Improbable: excess fines.	Improbable: excess fines.	Poor.
Cadeville	Poor	Improbable: excess fines.	Improbable: excess fines.	Poor.
RS*,**:				
Ruston	Poor	Improbable: excess fines.	Improbable: excess fines.	Poor.
Smithdale	Poor	Improbable: excess fines.	Improbable: excess fines.	Poor.
Sm: Smithdale	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
St: Sumter Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Un: Una	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Uo: Urbo Variant	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnotes at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Va----------------------- Vaiden	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Yo----------------------- Yorktown	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

** Ratings are poor because soil areas are within a military bombing range site.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Ad----------------- Armistead	Slight---------	Severe: piping, wetness.	Severe: slow refill.	Percs slowly---	Erodes easily, wetness.	Erodes easily, percs slowly.
Br----------------- Briley	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Droughty, slope.
Ca----------------- Caddo	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Percs slowly---	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Cd----------------- Cadeville	Moderate: slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Ce----------------- Cadeville	Severe: slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Ch----------------- Cahaba	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
Ga----------------- Gallion	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Gb----------------- Gallion	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
Gc----------------- Gallion	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Gn----------------- Glenmora	Moderate: seepage.	Moderate: piping, wetness.	Severe: slow refill.	Percs slowly---	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Go----------------- Gore	Moderate: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, rooting depth.
Gr----------------- Gore	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Gu----------------- Guyton	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Percs slowly---	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
GY*: Guyton------------	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Percs slowly, flooding.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Cascilla----------	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Ko----------------- Kolin	Slight---------	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly---	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
La-----------------Latanier	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Percs slowly---	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Ma-----------------Malbis	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
Me-----------------Mayhew	Slight---------	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly---	Erodes easily, wetness.	Wetness, erodes easily.
Mf-----------------Metcalf	Slight---------	Moderate: piping, wetness.	Severe: no water.	Percs slowly---	Erodes easily, wetness.	Erodes easily, percs slowly.
Mn, Mo------------Moreland	Slight---------	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly---	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Mr, Mt------------Moreland	Slight---------	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly---	Wetness, percs slowly.	Wetness, percs slowly.
Mw-----------------Moreland	Slight---------	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, flooding.	Wetness, percs slowly.	Wetness, percs slowly.
Nd, No, Nr--------Norwood	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Pt*. Pits						
RK*:						
Rigolette--------	Severe: slope.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Wetness, slope, droughty.
Kisatchie--------	Moderate: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rm, Rn, Ro--------Roxana	Moderate: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Erodes easily	Erodes easily.
Rp-----------------Ruston	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Favorable------	Favorable.
RR*;**:						
Ruston-----------	Severe---------	Severe---------	Severe---------	Deep to water	Favorable------	Favorable.
Cadeville--------	Severe---------	Severe---------	Severe---------	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
RS*;**:						
Ruston	Severe	Severe	Severe	Deep to water	Favorable	Favorable.
Smithdale	Severe	Severe	Severe	Deep to water	Favorable	Favorable.
Sm: Smithdale	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope.
St: Sumter Variant	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Un: Una	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly.	Wetness, percs slowly.
Uo: Urbo Variant	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Va: Vaiden	Moderate: slope.	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, slope.	Wetness, percs slowly.	Wetness, percs slowly.
Yo: Yorktown	Slight	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, percs slowly.	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

** Ratings are severe because soil areas are in a military bombing range site.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ad---------------- Armistead	0-14	Clay--------------	CH	A-7-6, A-7-5	0	100	100	100	95-100	51-70	25-40
	14-75	Silt loam, silty clay loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	75-100	<40	NP-20
Br---------------- Briley	0-30	Loamy fine sand	SM	A-2-4, A-4	0	97-100	95-100	80-100	17-45	<25	NP-4
	30-65	Fine sandy loam, sandy clay loam.	SC, CL	A-4, A-6	0	95-100	95-100	85-100	36-65	22-39	8-22
Ca---------------- Caddo	0-21	Silt loam---------	ML, CL-ML	A-4	0	100	100	95-100	70-95	<27	NP-7
	21-80	Silt loam, loam, silty clay loam.	CL	A-6	0	100	100	85-100	50-90	30-40	11-18
Cd---------------- Cadeville	0-6	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	95-100	55-65	<28	NP-7
	6-48	Silty clay, clay	CH, CL	A-7-6	0	100	100	95-100	80-95	41-60	22-35
	48-65	Clay, silty clay, silty clay loam.	CH, CL	A-7-6, A-6	0	100	100	95-100	75-95	30-55	12-30
Ce---------------- Cadeville	0-7	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	95-100	55-65	<28	NP-7
	7-42	Silty clay, clay	CH, CL	A-7-6	0	100	100	95-100	80-95	41-60	22-35
	42-65	Clay, silty clay, silty clay loam.	CH, CL	A-7-6, A-6	0	100	100	95-100	75-95	30-55	12-30
Ch---------------- Cahaba	0-8	Fine sandy loam	SM	A-4, A-2-4	0	95-100	95-100	65-90	30-45	---	NP
	8-48	Sandy clay loam, loam, sandy loam.	SC, CL	A-4, A-6	0	90-100	80-100	75-90	40-75	22-35	8-15
	48-65	Sand, loamy sand, sandy loam.	SM, SP-SM	A-2-4	0	95-100	90-100	60-85	10-35	---	NP
Ga---------------- Gallion	0-8	Silt loam---------	ML, CL-ML, CL	A-4, A-6	0	100	100	100	90-100	<28	NP-11
	8-34	Silt loam, silty clay loam, clay loam.	CL	A-6	0	100	100	100	90-100	28-40	11-17
	34-65	Stratified silty clay loam to very fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	23-34	4-12
Gb---------------- Gallion	0-6	Silty clay loam	CL	A-6	0	100	100	100	90-100	33-40	15-20
	6-41	Silt loam, silty clay loam, clay loam.	CL	A-6	0	100	100	100	90-100	28-40	11-17
	41-65	Stratified silty clay loam to very fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	23-34	4-12
Gc---------------- Gallion	0-9	Silt loam---------	ML, CL-ML, CL	A-4, A-6	0	100	100	100	90-100	<28	NP-11
	9-39	Silt loam, silty clay loam, clay loam.	CL	A-6	0	100	100	100	90-100	28-40	11-17
	39-65	Stratified silty clay loam to very fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	23-34	4-12

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Gn----------------- Glenmora	0-9	Silt loam---------	ML, CL-ML	A-4	0	100	100	90-100	75-85	<27	NP-7
	9-30	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	95-100	80-95	25-38	8-16
	30-69	Silty clay loam	CL	A-6	0	100	100	95-100	80-95	30-40	12-18
	69-80	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7-6	0	100	100	95-100	80-95	30-60	12-40
Go----------------- Gore	0-10	Silt loam---------	ML, CL-ML	A-4	0	100	100	95-100	60-90	<27	NP-7
	10-57	Clay, silty clay	CH	A-7-6, A-7-5	0	100	100	95-100	85-100	53-65	28-40
	57-65	Clay--------------	CH	A-7-6, A-7-5	0	100	100	95-100	85-100	51-83	25-53
Gr----------------- Gore	0-9	Silt loam---------	ML, CL-ML	A-4	0	100	100	95-100	60-90	<27	NP-7
	9-56	Clay, silty clay	CH	A-7-6, A-7-5	0	100	100	95-100	85-100	53-65	28-40
	56-80	Clay--------------	CH	A-7-6, A-7-5	0	100	100	95-100	85-100	51-83	25-53
Gu----------------- Guyton	0-24	Silt loam---------	ML, CL-ML	A-4	0	100	100	95-100	65-90	<27	NP-7
	24-54	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-6, A-4	0	100	100	94-100	75-95	22-40	6-18
	54-65	Silt loam, silty clay loam, sandy clay loam.	CL, CL-ML, ML	A-6, A-4	0	100	100	95-100	50-95	<40	NP-18
GY*:											
Guyton-----------	0-25	Silt loam---------	ML, CL-ML	A-4	0	100	100	95-100	65-90	<27	NP-7
	25-50	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-6, A-4	0	100	100	94-100	75-95	22-40	6-18
	50-96	Silt loam, silty clay loam, sandy clay loam.	CL, CL-ML, ML	A-6, A-4	0	100	100	95-100	50-95	<40	NP-18
Cascilla---------	0-8	Silt loam---------	ML, CL-ML, CL	A-4, A-6	0	100	100	95-100	75-95	20-38	3-15
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	75-100	20-39	5-15
	60-80	Fine sandy loam, loam, silt loam.	SM, ML, CL-ML, SM-SC	A-4	0	100	100	80-95	45-85	<30	NP-7
Ko----------------- Kolin	0-6	Silt loam---------	ML, CL-ML	A-4	0	100	100	85-100	60-85	<27	NP-7
	6-28	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	100	95-100	85-97	30-46	11-22
	28-74	Clay, silty clay	CH	A-7-6	0	100	100	90-100	75-95	50-63	25-35
La----------------- Latanier	0-6	Clay--------------	CH	A-7-6	0	100	100	100	95-100	51-75	26-45
	6-34	Clay, silty clay	CH	A-7-6	0	100	100	100	95-100	51-75	26-45
	34-65	Silt loam, silty clay loam, very fine sandy loam.	CL-ML, CL, ML	A-4, A-6	0	100	100	100	80-100	<40	NP-17
Ma----------------- Malbis	0-6	Fine sandy loam	SM, ML	A-4	0	100	97-100	92-97	40-62	<30	NP-5
	6-14	Loam, sandy clay loam, clay loam.	CL-ML, CL	A-4, A-6	0	99-100	95-100	91-100	55-70	25-35	5-11
	14-43	Sandy clay loam, clay loam.	ML, CL	A-4, A-5, A-6, A-7	0	98-100	96-100	90-100	56-80	29-49	4-15
	43-64	Sandy clay loam, clay loam.	ML, CL	A-4, A-5, A-6, A-7	0	98-100	96-100	90-100	56-80	30-49	4-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Me---------------- Mayhew	0-5	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	36-50	15-28
	5-35	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	100	100	95-100	85-95	46-75	25-50
	35-75	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	90-100	90-100	75-90	45-80	25-50
Mf---------------- Metcalf	0-4	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	90-100	65-90	<25	NP-6
	4-37	Silt loam, loam, clay loam.	CL	A-6	0	100	100	90-100	65-95	31-40	11-18
	37-75	Silty clay, clay, clay loam.	CH, CL	A-7-6	0	100	100	95-100	85-100	46-66	20-38
Mn---------------- Moreland	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	18-31	3-13
	11-38	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	38-65	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	25-45
Mo---------------- Moreland	0-12	Silty clay loam	CL	A-6, A-7-6	0	100	100	100	90-100	30-50	12-25
	12-44	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	44-65	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	25-45
Mr---------------- Moreland	0-10	Clay-------------	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	10-31	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	31-66	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	25-45
Mt---------------- Moreland	0-5	Clay-------------	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	5-36	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	36-65	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	25-45
Mw---------------- Moreland	0-11	Clay-------------	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	11-40	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	40-65	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	25-45
Nd---------------- Norwood	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	51-90	20-35	4-15
	8-20	Silt loam, silty clay loam, loam.	CL	A-6, A-7, A-4	0	100	100	90-100	60-98	25-46	7-26
	20-66	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	90-100	70-98	20-45	2-25
No---------------- Norwood	0-8	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-98	30-55	15-35
	8-23	Silt loam, silty clay loam, loam.	CL	A-6, A-7, A-4	0	100	100	90-100	60-98	25-46	7-26
	23-67	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	90-100	70-98	20-45	2-25
Nr---------------- Norwood	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	51-90	20-35	4-15
	13-37	Silt loam, silty clay loam, loam.	CL	A-6, A-7, A-4	0	100	100	90-100	60-98	25-46	7-26
	37-75	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	90-100	70-98	20-45	2-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pt*. Pits											
RK*:											
Rigolette-------	0-12	Loamy fine sand	SM, SM-SC	A-2	0	100	100	60-80	20-35	<20	NP-10
	12-17	Fine sandy loam, loam, sandy clay loam.	SM, SC, CL, SM-SC	A-2, A-4, A-6	0	100	100	70-95	30-60	15-40	4-21
	17-32	Loam, sandy clay loam.	SC, CL	A-6	0	100	100	70-90	35-65	17-40	7-21
	32-75	Clay, silty clay	CL, CH	A-7-6	2-25	80-98	80-95	75-90	55-85	47-80	22-50
Kisatchie-------	0-8	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	85-100	50-75	<25	NP-4
	8-24	Silty clay, silty clay loam, clay.	CH, CL	A-7-6	0	100	100	90-100	85-95	45-65	22-36
	24-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rm--------------- Roxana	0-6	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	85-100	50-75	<27	NP-7
	6-65	Silt loam, very fine sandy loam, loamy very fine sand.	ML, CL-ML	A-4	0	100	100	85-100	50-85	<27	NP-7
Rn, Ro----------- Roxana	0-5	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	85-100	50-75	<27	NP-7
	5-65	Silt loam, very fine sandy loam, loamy very fine sand.	ML, CL-ML	A-4	0	100	100	85-100	50-85	<27	NP-7
Rp--------------- Ruston	0-14	Fine sandy loam	SM, ML	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<20	NP-3
	14-33	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-40	11-20
	33-58	Fine sandy loam, sandy loam, loamy sand.	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<27	NP-7
	58-75	Sandy clay loam, clay loam, fine sandy loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-42	11-20
RR*:											
Ruston----------	0-10	Fine sandy loam	SM, ML	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<20	NP-3
	10-40	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-40	11-20
	40-50	Fine sandy loam, sandy loam, loamy sand.	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<27	NP-7
	50-80	Sandy clay loam, clay loam, fine sandy loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-42	11-20
Cadeville-------	0-7	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	95-100	55-65	<28	NP-7
	7-24	Silty clay, clay	CH, CL	A-7-6	0	100	100	95-100	80-95	41-60	22-35
	24-65	Clay, silty clay, silty clay loam.	CH, CL	A-7-6, A-6	0	100	100	95-100	75-95	30-55	12-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
RS*:											
Ruston----------	0-7	Fine sandy loam	SM, ML	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<20	NP-3
	7-41	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-40	11-20
	41-47	Fine sandy loam, sandy loam, loamy sand.	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<27	NP-7
	47-75	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-42	11-20
Smithdale-------	0-6	Fine sandy loam	SM, SM-SC	A-4	0	100	85-100	60-80	36-49	<20	NP-5
	6-36	Clay loam, sandy clay loam, loam.	SM-SC, SC, CL, CL-ML	A-6, A-4	0	100	85-100	80-95	45-75	23-38	7-15
	36-72	Loam, sandy loam	SM, ML, CL, SC	A-4	0	100	85-100	65-80	36-70	<30	NP-10
Sm--------------- Smithdale	0-9	Fine sandy loam	SM, SM-SC	A-4	0	100	85-100	60-80	36-49	<20	NP-5
	9-24	Clay loam, sandy clay loam, loam.	SM-SC, SC, CL, CL-ML	A-6, A-4	0	100	85-100	80-95	45-75	23-38	7-15
	24-65	Loam, sandy loam	SM, ML, CL, SC	A-4	0	100	85-100	65-80	36-70	<30	NP-10
St--------------- Sumter Variant	0-6	Silty clay loam	CL	A-7-6	0	100	100	95-100	85-95	26-40	11-33
	6-28	Silty clay loam, silty clay, clay.	CH, CL	A-7-6, A-6	0	100	100	95-100	85-95	35-55	16-32
	28-60	Silty clay, clay	CH, CL	A-7-6	0	100	100	95-100	85-95	45-65	22-42
Un--------------- Una	0-6	Silty clay-------	CH, CL	A-7	0	100	100	90-100	75-95	41-65	20-40
	6-80	Clay, silty clay loam, silty clay.	CH, CL	A-7	0	100	100	90-100	75-95	41-65	20-40
Uo--------------- Urbo Variant	0-4	Silty clay loam	CL	A-6, A-7-6	0	100	100	95-100	85-95	28-45	14-28
	4-31	Silty clay loam	CL, CH	A-6, A-7-6	0	100	100	95-100	85-95	32-51	14-33
	31-46	Sandy clay loam, loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0	100	100	80-90	45-75	16-40	5-22
	46-70	Fine sandy loam, loam, very fine sandy loam.	ML, CL, SM, SC	A-4, A-6	0	100	100	70-85	40-70	16-38	3-19
Va--------------- Vaiden	0-3	Silty clay-------	MH, CH	A-7	0	100	100	95-100	70-90	50-60	20-30
	3-21	Clay-------------	CH, MH	A-7	0	100	100	95-100	85-95	50-90	30-50
	21-75	Clay-------------	CH	A-7	0	100	100	95-100	85-95	50-90	30-52
Yo--------------- Yorktown	0-5	Silty clay-------	MH, CH, OH	A-7	0	100	100	100	95-100	55-75	24-45
	5-45	Clay-------------	CH	A-7	0	100	100	100	95-100	60-80	32-50
	45-65	Clay-------------	CH	A-7	0	100	100	95-100	90-100	60-80	32-50

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
Ad---------------- Armistead	0-14	40-55	1.20-1.35	0.06-0.2	0.18-0.20	6.1-8.4	High---------	0.32	5	2-4
	14-75	14-30	1.35-1.65	0.2-0.6	0.18-0.22	6.1-8.4	Low----------	0.37		
Br---------------- Briley	0-30	5-18	1.50-1.65	6.0-20	0.07-0.11	4.5-6.5	Low----------	0.20	5	<1
	30-65	15-35	1.55-1.69	0.6-2.0	0.13-0.17	4.5-6.0	Low----------	0.24		
Ca---------------- Caddo	0-21	14-27	1.35-1.70	0.6-2.0	0.18-0.23	4.5-6.0	Low----------	0.49	5	.5-2
	21-80	18-35	1.35-1.70	0.06-0.2	0.20-0.22	4.5-6.0	Low----------	0.37		
Cd---------------- Cadeville	0-6	10-22	1.30-1.65	0.6-2.0	0.14-0.22	3.6-6.0	Low----------	0.43	5	.5-1
	6-48	39-60	1.20-1.45	<0.06	0.18-0.20	3.6-5.5	High---------	0.32		
	48-65	30-60	1.20-1.65	<0.2	0.18-0.20	3.6-5.5	High---------	0.32		
Ce---------------- Cadeville	0-7	10-22	1.30-1.65	0.6-2.0	0.14-0.22	3.6-6.0	Low----------	0.43	5	.5-1
	7-42	39-60	1.20-1.45	<0.06	0.18-0.20	3.6-5.5	High---------	0.32		
	42-65	30-60	1.20-1.65	<0.2	0.18-0.20	3.6-5.5	High---------	0.32		
Ch---------------- Cahaba	0-8	7-17	1.35-1.60	2.0-6.0	0.10-0.14	4.5-6.0	Low----------	0.24	5	.5-2
	8-48	18-35	1.35-1.60	0.6-2.0	0.12-0.15	4.5-6.0	Low----------	0.28		
	48-65	4-20	1.40-1.70	2.0-20	0.05-0.10	4.5-6.0	Low----------	0.24		
Ga---------------- Gallion	0-8	14-27	1.35-1.65	0.6-2.0	0.21-0.23	5.6-7.3	Low----------	0.43	5	.5-2
	8-34	14-35	1.35-1.75	0.6-2.0	0.20-0.22	5.6-7.8	Moderate-----	0.32		
	34-65	14-35	1.35-1.75	0.6-2.0	0.20-0.23	6.1-8.4	Low----------	0.37		
Gb---------------- Gallion	0-6	27-35	1.35-1.65	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.32	5	.5-2
	6-41	14-35	1.35-1.75	0.6-2.0	0.20-0.22	5.6-7.8	Moderate-----	0.32		
	41-65	14-35	1.35-1.75	0.6-2.0	0.20-0.23	6.1-8.4	Low----------	0.37		
Gc---------------- Gallion	0-9	14-27	1.35-1.65	0.6-2.0	0.21-0.23	5.6-7.3	Low----------	0.43	5	.5-2
	9-39	14-35	1.35-1.75	0.6-2.0	0.20-0.22	5.6-7.8	Moderate-----	0.32		
	39-65	14-35	1.35-1.75	0.6-2.0	0.20-0.23	6.1-8.4	Low----------	0.37		
Gn---------------- Glenmora	0-9	8-22	1.35-1.65	0.6-2.0	0.20-0.23	4.5-6.0	Low----------	0.49	5	.5-2
	9-30	18-35	1.35-1.65	0.6-2.0	0.18-0.20	4.5-6.0	Low----------	0.43		
	30-69	27-35	1.35-1.70	0.06-0.2	0.18-0.20	4.5-6.0	Moderate-----	0.43		
	69-80	35-45	1.35-1.70	0.06-0.2	0.14-0.20	4.5-6.0	High---------	0.37		
Go---------------- Gore	0-10	5-15	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low----------	0.49	5	.5-4
	10-57	40-60	1.30-1.75	<0.06	0.14-0.18	4.5-7.3	High---------	0.32		
	57-65	40-80	1.30-1.75	<0.06	0.14-0.18	4.5-8.4	High---------	0.32		
Gr---------------- Gore	0-9	5-15	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low----------	0.49	5	.5-4
	9-56	40-60	1.30-1.75	<0.06	0.14-0.18	4.5-7.3	High---------	0.32		
	56-80	40-80	1.30-1.75	<0.06	0.14-0.18	4.5-8.4	High---------	0.32		
Gu---------------- Guyton	0-24	7-25	1.35-1.65	0.6-2.0	0.20-0.23	3.6-6.0	Low----------	0.43	5	<2
	24-54	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-6.0	Low----------	0.37		
	54-65	20-35	1.35-1.70	0.06-2.0	0.15-0.22	3.6-8.4	Low----------	0.37		
GY*:										
Guyton-----------	0-25	7-25	1.35-1.65	0.6-2.0	0.20-0.23	3.6-6.0	Low----------	0.43	5	<2
	25-50	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-6.0	Low----------	0.37		
	50-96	20-35	1.35-1.70	0.06-2.0	0.15-0.22	3.6-8.4	Low----------	0.37		
Cascilla---------	0-8	5-20	1.40-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43	5	1-3
	8-60	18-30	1.45-1.50	0.6-2.0	0.16-0.20	4.5-5.5	Low----------	0.43		
	60-80	5-25	1.40-1.50	0.6-2.0	0.16-0.20	4.5-5.5	Low----------	0.43		
Ko---------------- Kolin	0-6	10-27	1.35-1.65	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.49	5	.5-2
	6-28	20-35	1.35-1.65	0.2-0.6	0.18-0.22	4.5-6.0	Moderate-----	0.37		
	28-74	40-55	1.20-1.65	<0.06	0.15-0.18	4.5-6.5	High---------	0.32		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
La----------------- Latanier	0-6	40-55	1.20-1.70	<0.06	0.18-0.20	6.6-8.4	Very high----	0.32	5	.5-4
	6-34	40-55	1.20-1.70	<0.06	0.18-0.20	6.6-8.4	Very high----	0.32		
	34-65	10-27	1.30-1.65	0.06-2.0	0.18-0.22	6.6-8.4	Low----------	0.37		
Ma----------------- Malbis	0-6	10-25	1.35-1.70	0.6-2.0	0.10-0.15	4.5-6.0	Low----------	0.24	5	.5-1
	6-14	18-33	1.40-1.70	0.6-2.0	0.12-0.20	4.5-5.5	Low----------	0.28		
	14-43	20-35	1.40-1.70	0.6-2.0	0.12-0.17	4.5-5.5	Low----------	0.28		
	43-64	20-35	1.40-1.70	0.2-0.6	0.12-0.17	4.5-5.5	Low----------	0.28		
Me----------------- Mayhew	0-5	10-40	1.35-1.45	0.06-0.2	0.20-0.22	4.5-6.0	Moderate-----	0.37	5	1-3
	5-35	35-60	1.20-1.55	<0.06	0.18-0.20	4.5-6.0	High---------	0.32		
	35-75	35-75	1.20-1.55	<0.06	0.18-0.20	4.5-6.0	High---------	0.32		
Mf----------------- Metcalf	0-4	8-22	1.35-1.65	0.6-2.0	0.12-0.18	3.6-6.0	Low----------	0.49	5	.5-2
	4-37	18-27	1.35-1.65	0.2-0.6	0.15-0.20	3.6-6.0	Low----------	0.37		
	37-75	40-60	1.20-1.55	<0.06	0.15-0.18	3.6-6.0	High---------	0.32		
Mn----------------- Moreland	0-11	18-27	1.40-1.65	0.6-2.0	0.21-0.23	6.1-7.8	Low----------	0.43	5	2-4
	11-38	39-60	1.20-1.45	<0.06	0.18-0.20	6.6-8.4	High---------	0.32		
	38-65	35-60	1.20-1.75	<0.2	0.18-0.21	7.4-8.4	Very high----	0.32		
Mo----------------- Moreland	0-12	27-39	1.45-1.75	0.06-0.2	0.19-0.21	6.1-7.8	Moderate-----	0.37	5	2-4
	12-44	39-60	1.20-1.45	<0.06	0.18-0.20	6.6-8.4	High---------	0.32		
	44-65	35-60	1.20-1.75	<0.2	0.18-0.21	7.4-8.4	Very high----	0.32		
Mr----------------- Moreland	0-10	39-50	1.20-1.50	<0.06	0.18-0.20	6.1-7.8	Very high----	0.32	5	2-4
	10-31	39-60	1.20-1.45	<0.06	0.18-0.20	6.6-8.4	High---------	0.32		
	31-66	35-60	1.20-1.75	<0.2	0.18-0.21	7.4-8.4	Very high----	0.32		
Mt----------------- Moreland	0-5	39-50	1.20-1.50	<0.06	0.18-0.20	6.1-7.8	Very high----	0.32	5	2-4
	5-36	39-60	1.20-1.45	<0.06	0.18-0.20	6.6-8.4	High---------	0.32		
	36-65	35-60	1.20-1.75	<0.2	0.18-0.21	7.4-8.4	Very high----	0.32		
Mw----------------- Moreland	0-11	39-50	1.20-1.50	<0.06	0.18-0.20	6.1-7.8	Very high----	0.32	5	2-4
	11-40	39-60	1.20-1.45	<0.06	0.18-0.20	6.6-8.4	High---------	0.32		
	40-65	35-60	1.20-1.75	<0.2	0.18-0.21	7.4-8.4	Very high----	0.32		
Nd----------------- Norwood	0-8	10-27	1.35-1.65	0.6-2.0	0.17-0.21	7.4-8.4	Low----------	0.43	5	.5-2
	8-20	18-35	1.35-1.65	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43		
	20-66	10-35	1.35-1.65	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43		
No----------------- Norwood	0-8	27-40	1.35-1.65	0.6-2.0	0.18-0.22	7.4-8.4	Moderate-----	0.32	5	.5-2
	8-23	18-35	1.35-1.65	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43		
	23-67	10-35	1.35-1.65	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43		
Nr----------------- Norwood	0-13	10-27	1.35-1.65	0.6-2.0	0.17-0.21	7.4-8.4	Low----------	0.43	5	.5-2
	13-37	18-35	1.35-1.65	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43		
	37-75	10-35	1.35-1.65	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43		
Pt*. Pits										
RK*: Rigolette--------	0-12	3-10	1.35-1.70	6.0-20.0	0.07-0.11	4.5-5.5	Low----------	0.20	4	.5-1
	12-17	18-30	1.35-1.65	0.6-2.0	0.11-0.20	4.5-5.5	Low----------	0.32		
	17-32	20-35	1.35-1.65	0.6-2.0	0.12-0.17	4.5-5.5	Moderate-----	0.32		
	32-75	50-70	1.20-1.60	<0.06	0.08-0.11	3.6-5.5	High---------	0.32		
Kisatchie--------	0-8	10-27	1.35-1.65	0.6-2.0	0.12-0.20	4.5-5.5	Low----------	0.43	3	.5-2
	8-24	35-55	1.20-1.70	<0.06	0.15-0.18	3.6-5.0	High---------	0.32		
	24-60	---	---	---	---	---	-------------	----		
Rm----------------- Roxana	0-6	5-27	1.35-1.80	0.6-2.0	0.10-0.21	6.1-8.4	Low----------	0.43	5	.5-2
	6-65	10-18	1.35-1.80	0.6-2.0	0.10-0.19	6.6-8.4	Low----------	0.37		
Rn, Ro------------ Roxana	0-5	5-27	1.35-1.80	0.6-2.0	0.10-0.21	6.1-8.4	Low----------	0.43	5	.5-2
	5-65	10-18	1.35-1.80	0.6-2.0	0.10-0.19	6.6-8.4	Low----------	0.37		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
Rp----------------Ruston	0-14	5-20	1.30-1.70	0.6-2.0	0.09-0.16	4.5-6.5	Low-----------	0.28	5	.5-2
	14-33	18-35	1.40-1.80	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.28		
	33-58	10-20	1.30-1.70	0.6-2.0	0.12-0.15	4.5-6.0	Low-----------	0.32		
	58-75	15-38	1.40-1.70	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.28		
RR*:										
Ruston-----------	0-10	5-20	1.30-1.70	0.6-2.0	0.09-0.16	4.5-6.5	Low-----------	0.28	5	.5-2
	10-40	18-35	1.40-1.80	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.28		
	40-50	10-20	1.30-1.70	0.6-2.0	0.12-0.15	4.5-6.0	Low-----------	0.32		
	50-80	15-38	1.40-1.70	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.28		
Cadeville--------	0-7	10-22	1.30-1.65	0.6-2.0	0.14-0.22	3.6-6.0	Low-----------	0.43	5	.5-1
	7-24	39-60	1.20-1.45	<0.06	0.18-0.20	3.6-5.5	High----------	0.32		
	24-65	30-60	1.20-1.65	<0.2	0.18-0.20	3.6-5.5	High----------	0.32		
RS*:										
Ruston-----------	0-7	5-20	1.30-1.70	0.6-2.0	0.09-0.16	4.5-6.5	Low-----------	0.28	5	.5-2
	7-41	18-35	1.40-1.80	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.28		
	41-47	10-20	1.30-1.70	0.6-2.0	0.12-0.15	4.5-6.0	Low-----------	0.32		
	47-75	15-38	1.40-1.70	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.28		
Smithdale--------	0-6	2-15	1.40-1.50	2.0-6.0	0.14-0.16	4.5-5.5	Low-----------	0.28	5	.5-2
	6-36	18-33	1.40-1.55	0.6-2.0	0.15-0.17	4.5-5.5	Low-----------	0.24		
	36-72	12-27	1.40-1.55	2.0-6.0	0.14-0.16	4.5-5.5	Low-----------	0.28		
Sm----------------Smithdale	0-9	2-15	1.40-1.50	2.0-6.0	0.14-0.16	4.5-5.5	Low-----------	0.28	5	.5-2
	9-24	18-33	1.40-1.55	0.6-2.0	0.15-0.17	4.5-5.5	Low-----------	0.24		
	24-65	12-27	1.40-1.55	2.0-6.0	0.14-0.16	4.5-5.5	Low-----------	0.28		
St----------------Sumter Variant	0-6	27-39	1.35-1.65	0.06-2.0	0.12-0.17	7.4-8.4	High----------	0.37	5	1-5
	6-28	35-57	1.20-1.65	0.06-2.0	0.12-0.17	7.4-8.4	High----------	0.37		
	28-60	40-60	1.20-1.50	0.06-2.0	0.12-0.17	7.4-8.4	High----------	0.37		
Un----------------Una	0-6	28-45	1.40-1.60	<0.06	0.15-0.20	4.5-5.5	High----------	0.32	5	1-3
	6-80	28-55	1.40-1.60	<0.06	0.15-0.20	4.5-5.5	High----------	0.28		
Uo----------------Urbo Variant	0-4	25-38	1.35-1.65	0.2-0.6	0.16-0.22	4.5-5.5	Moderate------	0.43	5	.5-2
	4-31	27-35	1.35-1.65	0.06-0.2	0.18-0.22	4.5-5.5	Moderate------	0.37		
	31-46	20-35	1.35-1.65	0.06-0.2	0.12-0.20	4.5-5.5	Moderate------	0.32		
	46-70	10-25	1.35-1.65	0.2-0.6	0.11-0.20	4.5-5.5	Low-----------	0.32		
Va----------------Vaiden	0-3	25-55	1.20-1.40	0.06-0.2	0.10-0.15	4.5-6.5	High----------	0.32	4	.5-2
	3-21	60-75	1.20-1.40	<0.06	0.10-0.15	4.5-6.0	Very high-----	0.32		
	21-75	40-75	1.20-1.40	<0.06	0.10-0.15	4.5-7.8	Very high-----	0.32		
Yo----------------Yorktown	0-5	40-65	1.15-1.45	<0.06	0.12-0.18	5.6-7.3	High----------	0.32	5	1-5
	5-45	60-80	1.15-1.45	<0.06	0.12-0.18	5.6-7.3	Very high-----	0.32		
	45-65	60-80	1.15-1.45	<0.06	0.12-0.18	7.4-8.4	Very high-----	0.32		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Map symbol and soil name	Hydrologic group	Flooding				High water table			Risk of corrosion	
		Yearly	Cropping seasons							
			Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
						Ft				
Ad----------------- Armistead	C	None------	None---------	---	---	1.5-3.0	Apparent	Dec-Apr	High-----	Low.
Br----------------- Briley	B	None------	None---------	---	---	>6.0	---	---	Moderate	High.
Ca----------------- Caddo	D	None------	None---------	---	---	0-2.0	Apparent	Dec-Apr	High-----	Moderate.
Cd, Ce------------- Cadeville	D	None------	None---------	---	---	>6.0	---	---	Moderate	Moderate.
Ch----------------- Cahaba	B	None------	None---------	---	---	>6.0	---	---	Moderate	Moderate.
Ga, Gb------------- Gallion	B	None------	None---------	---	---	>6.0	---	---	Moderate	Low.
Gc----------------- Gallion	B	Occasional	Occasional	Brief to long.	Jun-Nov	>6.0	---	---	Moderate	Low.
Gn----------------- Glenmora	C	None------	None---------	---	---	2.0-3.0	Apparent	Dec-Apr	High-----	Moderate.
Go, Gr------------- Gore	D	None------	None---------	---	---	>6.0	---	---	High-----	Low.
Gu----------------- Guyton	D	None------	None---------	---	---	0-1.5	Perched	Dec-May	High-----	Moderate.
GY*:										
Guyton------------	D	Frequent--	Frequent----	Very brief to long.	Jun-Nov	0-1.5	Perched	Dec-May	High-----	Moderate.
Cascilla----------	B	Frequent--	Frequent----	Brief to very long.	Jun-Nov	>6.0	---	---	Low------	Moderate.
Ko----------------- Kolin	C	None------	None---------	---	---	1.5-3.0	Perched	Dec-Apr	High-----	Moderate.
La----------------- Latanier	D	None------	None---------	---	---	1.0-3.0	Apparent	Dec-Apr	High-----	Low.
Ma----------------- Malbis	B	None------	None---------	---	---	2.5-4.0	Perched	Dec-Mar	Moderate	Moderate.
Me----------------- Mayhew	D	None------	None---------	---	---	0-1.0	Apparent	Jan-Mar	High-----	High.
Mf----------------- Metcalf	D	None------	None---------	---	---	1.5-2.5	Perched	Dec-Apr	High-----	Moderate.
Mn, Mo, Mr, Mt---- Moreland	D	Rare------	Rare---------	---	---	0-1.5	Perched	Dec-Apr	High-----	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding				High water table			Risk of corrosion	
		Yearly	Cropping seasons							
			Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
						Ft				
Mw----------------- Moreland	D	Occasional	Occasional	Brief to long.	Jun-Nov	0-1.5	Perched	Dec-Apr	High-----	Low.
Nd, No, Nr-------- Norwood	B	None------	None--------	---	---	>6.0	---	---	High-----	Low.
Pt*. Pits										
RK*:										
Rigolette--------	C	None------	None--------	---	---	0-1.5	Perched	Jan-Mar	High-----	High.
Kisatchie--------	D	None------	None--------	---	---	>6.0	---	---	High-----	High.
Rm----------------- Roxana	B	None------	None--------	---	---	4.0-6.0	Apparent	Dec-Apr	Low------	Low.
Rn----------------- Roxana	B	Occasional	Occasional	Brief-----	Jun-Nov	4.0-6.0	Apparent	Dec-Apr	Low------	Low.
Ro----------------- Roxana	B	Frequent--	Frequent----	Brief to long.	Jun-Nov	4.0-6.0	Apparent	Dec-Apr	Low------	Low.
Rp----------------- Ruston	B	None------	None--------	---	---	>6.0	---	---	Moderate	Moderate.
RR*:										
Ruston-----------	B	None------	None--------	---	---	>6.0	---	---	Moderate	Moderate.
Cadeville--------	D	None------	None--------	---	---	>6.0	---	---	Moderate	Moderate.
RS*:										
Ruston-----------	B	None------	None--------	---	---	>6.0	---	---	Moderate	Moderate.
Smithdale--------	B	None------	None--------	---	---	>6.0	---	---	Low------	Moderate.
Sm----------------- Smithdale	B	None------	None--------	---	---	>6.0	---	---	Low------	Moderate.
St----------------- Sumter Variant	C	None------	None--------	---	---	>6.0	---	---	Moderate	Low.
Un----------------- Una	D	Frequent--	Frequent----	Brief to long.	Jun-Nov	0.5-1.0	Apparent	Nov-Apr	High-----	High.
Uo----------------- Urbo Variant	C	Frequent--	Occasional	Brief to very long.	Jun-Nov	1.0-2.0	Apparent	Dec-Apr	High-----	Moderate.
Va----------------- Vaiden	D	None------	None--------	---	---	1.0-2.0	Apparent	Nov-Mar	High-----	High.
Yo----------------- Yorktown	D	Frequent--	Frequent----	Very long	Jun-Nov	+5-0.5	Apparent	Oct-Aug	High-----	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--PHYSICAL TEST DATA

[Analysis by Soil Characterization Laboratory of the Louisiana Agricultural Experiment Station. Dashes indicate a
not made]

Soil and sample number	Horizon	Depth from surface	Particle size distribution: Sand: Very coarse 2.0-1.0mm	Sand: Coarse 1.0-0.5mm	Sand: Medium 0.5-0.25mm	Sand: Fine 0.25-0.10mm	Sand: Very fine 0.10-0.05mm	Sand: Total 2.0-0.05mm	Silt 0.05-0.002mm	Clay <0.002 mm	Water content at tension: 1/3 Bar	Water content at tension: 15 Bar	B... Air dry
		In	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	G/CC
Cadeville very fine sandy loam: (S79LA43-5)	A1	0-3	2.13	4.26	4.21	4.52	28.34	43.46	43.70	12.84	26.34	11.09	1.17
	A2	3-6	1.63	2.42	1.55	1.86	36.51	43.97	38.19	17.84	19.70	7.34	1.62
	B21t	6-17	0.24	0.40	0.40	0.69	11.71	13.44	25.31	61.25	45.69	22.54	1.75
	B22t	17-32	0.00	0.13	0.29	0.66	8.76	9.84	27.09	53.07	45.30	22.42	1.87
	B23t	32-41	0.13	0.13	0.24	0.42	10.48	11.40	27.76	60.84	45.23	22.39	1.90
	B24t	41-48	0.05	0.11	0.13	0.29	5.59	6.17	33.66	60.92	47.84	22.83	1.86
	C	48-65	0.03	0.50	0.16	0.27	9.96	10.47	31.10	58.43	49.65	22.82	1.72
Malbis fine sandy loam: (S79LA43-1)	Ap	0-6	0.80	2.40	9.10	30.70	17.70	60.20	27.30	12.60	10.26	2.48	1.52
	B21t	6-14	0.50	1.40	5.50	20.70	13.90	42.40	24.30	33.30	17.70	10.10	1.70
	B22t(1)	14-24	0.10	0.80	6.00	21.20	15.50	43.50	20.50	36.00	19.41	10.24	1.73
	B22t(2)	24-35	0.40	1.20	5.70	24.60	14.90	46.70	22.70	30.60	16.29	9.38	1.79
	B23t	35-43	0.20	1.10	5.60	24.60	14.40	45.90	21.00	33.10	15.76	9.38	1.82
	B24t	43-64	0.20	1.20	6.60	27.50	14.50	49.90	16.50	33.60	15.48	7.48	1.82
Metcalf very fine sandy loam: (S79LA43-4)	A1	0-4	0.66	1.73	1.47	2.82	40.66	47.34	45.04	7.62	20.05	4.14	1.37
	A2	4-7	0.40	1.14	0.58	1.34	36.43	39.89	50.01	10.10	22.58	4.37	1.59
	B21t	7-15	0.18	0.84	0.51	1.35	33.96	36.84	45.31	17.85	22.00	8.62	1.68
	B22t	15-23	0.21	0.95	0.54	0.98	25.06	27.95	44.38	25.67	32.03	10.33	1.62
	B23t	23-30	0.05	0.33	0.33	1.16	28.97	30.81	46.02	23.14	26.63	9.69	1.62
	B&A'	30-37	0.33	0.51	0.36	1.08	28.64	30.92	46.00	23.08	26.01	10.53	1.57
	IIB24t	37-48	0.08	0.21	0.36	1.27	26.92	28.84	37.35	33.81	33.65	14.28	1.89
	IIB25t	48-61	0.16	0.86	0.47	1.23	25.59	28.31	35.14	36.55	37.59	16.62	1.72
	IIC	61-75	0.03	0.48	0.63	0.85	20.12	22.11	27.67	50.22	46.32	21.72	1.72
Ruston fine sandy loam: (S79LA43-2)	A1	0-4	0.10	1.66	13.75	34.10	24.93	74.54	12.89	12.57	10.26	2.48	1.37
	A2	4-14	0.18	1.13	11.41	33.55	26.36	72.63	14.80	12.57	17.70	10.10	1.57
	B21t	14-33	0.05	0.64	7.66	27.84	17.88	49.07	20.28	30.65	19.41	10.24	1.76
	B22t	33-43	0.08	1.13	11.60	32.12	21.87	66.74	27.17	10.09	16.29	9.38	1.73
	B&A'2	43-58	0.45	1.01	10.66	33.31	28.48	73.91	18.55	7.54	15.76	9.38	1.72
	B'21t	58-69	0.08	0.53	11.32	36.00	27.22	75.15	17.30	7.54	15.48	7.48	1.80
	B'22t	69-75	0.00	0.20	9.79	40.40	21.05	71.94	5.16	22.90	16.17	11.32	1.84

TABLE 19.--CHEMICAL TEST DATA

[Analysis by Soil Characterization Laboratory of the Louisiana Agricultural Experiment Station]

Soil and sample number	Horizon	Depth from surface	Extractable bases				Extractable acidity	Cation exchange capacity (NH$_4$OAc)	Base saturation	Organic carbon	Nitrogen	pH			Extractable iron	Extractable
			Ca	Mg	K	Na						1:1 H_2O	1:1 KCl	1:2 $CaCl_2$		
		In	Meq/100g						Pct	Pct	Pct				Pct	
Cadeville very fine sandy loam: (S79LA43-5)	A1	0-3	3.36	2.68	0.20	0.00	14.83	15.6	40.4	4.26	0.20	4.39	3.60	4.04	1.04	0
	A2	3-6	3.58	2.19	0.11	0.10	4.37	9.9	60.5	0.64	0.04	5.07	3.97	4.41	1.28	0
	B21t	6-17	3.42	7.41	0.49	0.66	16.19	26.5	64.1	0.29	0.04	4.90	3.65	4.29	1.83	4
	B22t	22-32	4.13	8.31	0.69	1.52	24.07	28.4	51.6	0.21	0.03	4.26	2.99	3.62	1.14	12
	B23t	32-41	3.66	9.29	0.69	2.58	20.16	29.0	55.9	0.21	0.02	3.95	2.83	3.49	0.85	10
	B24t	41-48	4.11	10.68	0.81	3.82	21.30	30.0	64.7	0.17	0.03	3.77	2.79	3.46	0.81	10
	C	48-65	4.32	11.66	0.85	5.60	16.40	27.9	76.8	0.11	0.02	3.86	3.02	3.68	0.39	6
Malbis fine sandy loam: (S79LA43-1)	Ap	0-6	0.50	0.00	0.10	0.00	4.36	4.0	37.5	0.86	0.05	5.10	3.94	4.14	0.32	0
	B21t	6-14	0.54	1.72	0.11	0.00	8.73	7.9	29.6	0.23	0.02	4.64	3.66	3.86	1.54	3
	B22t(1)	14-24	0.04	1.40	0.09	0.00	9.05	8.5	18.0	0.11	0.02	4.73	3.66	3.84	1.53	4
	B22t(2)	24-35	0.00	0.72	0.08	0.00	7.66	16.9	4.7	0.05	0.01	4.64	3.68	3.86	1.55	3
	B23t	35-43	0.00	1.17	0.07	0.00	6.92	5.9	21.0	0.08	0.02	4.67	3.63	3.80	1.51	3
	B24t	43-64	0.00	1.56	0.04	0.00	6.60	7.0	23.6	0.04	0.01	4.70	3.62	3.84	1.67	3
Metcalf very fine sandy loam: (S79LA43-4)	A1	0-4	1.84	0.82	0.07	0.02	7.88	7.8	35.3	1.35	0.07	4.72	3.77	4.15	0.55	0
	A2	4-7	0.77	0.75	0.05	0.01	8.16	5.8	27.2	0.46	0.03	4.70	3.65	3.97	0.50	2
	B21t	7-15	0.96	1.43	0.07	0.12	10.33	9.6	26.9	0.29	0.03	4.69	3.49	3.88	0.95	5
	B22t	15-23	0.50	1.30	0.12	0.20	13.42	11.3	18.8	0.20	0.02	4.80	3.50	3.77	1.29	7
	B23t	23-30	0.25	1.01	0.07	0.30	13.20	11.6	14.1	0.14	0.02	4.83	3.46	3.77	1.18	6
	B&A'	30-37	0.69	1.66	0.08	0.65	12.35	11.9	25.9	0.14	0.02	5.15	3.39	3.80	1.09	6
	IIB24t	37-48	2.38	4.61	0.16	1.89	11.93	17.7	51.1	0.12	0.01	4.82	3.24	3.82	1.17	7
	IIB25t	48-61	0.58	1.77	0.05	0.00	14.27	7.8	30.8	0.07	0.01	4.44	2.97	3.74	0.60	6
	IIC	61-75	5.33	10.76	0.48	4.79	12.99	24.6	86.8	0.07	0.02	4.19	2.93	3.70	0.69	4
Ruston fine sandy loam: (S79LA43-2)	A1	0-4	1.22	0.24	0.11	0.07	3.83	3.3	49.7	0.81	0.05	5.27	4.54	4.72	0.20	0
	A2	4-14	0.05	0.00	0.09	0.00	1.38	1.6	8.8	0.19	0.02	5.12	4.24	4.49	0.22	0
	B21t	14-33	1.42	2.24	0.31	0.11	5.22	8.0	56.0	0.11	0.02	4.94	3.80	4.22	1.22	1
	B22t	33-43	0.00	0.35	0.13	0.00	2.88	2.9	16.6	0.04	0.01	4.74	3.81	3.96	0.54	1
	B&A'2	43-58	0.00	0.22	0.09	0.01	2.13	2.2	14.5	0.03	0.02	4.69	3.97	3.98	0.40	1
	B'21t	58-69	0.00	0.50	0.10	0.01	2.45	2.5	24.4	0.00	0.01	4.81	3.82	4.03	0.49	1
	B'22t	69-75	5.51	2.66	0.20	0.04	6.92	7.1	58.9	0.04	0.01	4.67	3.62	3.93	1.17	3

TABLE 20.--CHEMICAL TEST DATA

[Analysis by Soil Fertility Laboratory of the Louisiana Agricultural Experiment Station. The symbol TR means tra
< means less than. Dashes indicate data were not available]

Soil sample and number	Depth from surface	Horizon	pH 1:1 H_2O	Organic matter content	P	Exchangeable cations Ca	Mg	K	Na	Al	H	Extractable acidity	Cation exchange capacity (sum)	Perc ba satur (sum
	In			Pct	Ppm	Meq/100g								
Armistead clay: (S79LA43-11)	0-5	Ap	6.5	---	93	13.9	7.7	0.7	0.3	0.0	0.3	3.9	26.5	8
	5-14	A1	7.1	---	159	19.5	9.3	0.2	0.2	0.0	0.3	5.8	36.0	8
	14-23	IIA	7.3	---	79	12.5	5.3	0.2	0.2	0.0	0.2	1.0	19.2	9
	23-35	IIB21t	7.6	---	102	10.7	4.7	0.2	0.2	0.0	0.2	1.9	17.7	8
	35-52	IIB22t	7.5	---	115	8.5	3.6	0.2	0.1	0.0	0.3	1.0	13.4	9
Caddo silt loam: (S78LA43-2)	0-4	A1	4.6	0.73	5	2.0	0.8	0.1	0.1	1.4	0.3	10.4	13.4	2
	4-11	A21g	5.1	0.10	5	1.1	0.8	TR	0.1	2.6	0.8	4.4	6.4	3
	11-21	A22g	5.3	0.20	5	1.0	0.7	TR	0.3	3.2	0.8	5.8	7.8	2
	21-35	B&A	5.5	0.15	5	2.8	2.0	0.1	1.5	4.4	0.8	7.6	14.0	4
	35-61	B22tg	5.1	0.07	5	4.5	3.6	0.1	3.6	3.7	0.9	12.0	23.7	4
	61-80	B3g	4.8	0.07	5	6.9	5.4	0.2	5.0	4.6	0.8	13.6	31.1	5
Cahaba fine sandy loam: (S78LA43-1)	0-4	A1	4.8	1.10	5	1.0	0.4	0.1	0.1	0.5	0.4	2.4	4.0	4
	4-8	A&B	5.5	0.25	5	0.9	0.5	0.1	0.1	0.5	0.3	2.9	4.5	3
	8-18	B21t	5.3	0.15	5	0.6	1.1	0.1	TR	1.8	0.9	3.3	5.1	3
	18-40	B22t	5.4	0.04	5	0.3	0.4	0.1	TR	1.3	0.7	3.3	4.1	1
	40-48	B3	5.4	0.02	5	0.2	0.2	TR	TR	0.7	0.3	2.9	3.3	1
	48-65	C	5.5	0.01	6	0.2	0.2	0.1	TR	0.8	0.6	2.9	3.4	1
Cascilla silt loam: (S79LA43-16)	0-8	Ap	4.7	0.09	6	0.4	0.1	0.1	TR	2.7	0.5	9.7	10.3	
	8-14	B1	4.7	0.01	5	0.3	0.2	TR	TR	3.1	0.8	8.0	8.5	
	14-25	B21	4.7	0.02	5	0.2	0.2	0.1	TR	3.5	0>8	?.6	7.7	
	25-42	B22	4.9	TR	5	0.2	0.2	0.1	TR	4.3	0.0	7.8	8.3	
	42-60	B3	5.0	TR	7	0.2	0.4	0.2	TR	4.8	0.6	6.8	7.6	1
Gallion silt loam: (S79LA43-12)	0-8	Ap	6.2	0.01	39	4.8	3.0	0.2	0.1	0.0	0.3	2.4	10.5	7
	8-19	B21t	6.3	0.17	84	12.1	7.6	0.3	0.1	0.0	0.2	3.6	23.9	8
	19-34	B22t	6.4	0.01	36	6.6	4.1	0.2	TR	0.0	0.2	4.0	14.9	7
	34-49	B3	6.4	0.05	49	6.0	4.0	0.2	TR	0.0	0.2	4.8	15.0	6
	49-65	C	6.8	TR	129	6.5	4.7	0.2	TR	0.0	0.2	2.4	13.8	8
Glenmora silt loam: (S80LA43-3)	0-5	A1	5.1	2.67	6	5.3	1.3	0.1	0.2	0.0	0.3	10.7	17.6	3
	5-9	A2	5.6	0.23	5	1.8	1.1	TR	0.2	1.4	0.5	6.0	9.1	3
	9-15	B1	5.7	0.15	5	1.5	1.2	TR	0.2	2.5	0.3	5.4	8.3	3
	15-30	B21t	5.8	0.09	5	0.6	1.0	0.1	0.3	4.1	0.1	4.8	6.8	2
	30-38	B&A'2	6.0	0.04	5	1.1	1.5	0.1	0.6	5.6	0.4	9.8	13.1	2
	38-54	B22t	5.9	0.02	5	2.3	2.4	0.1	1.0	4.8	0.0	8.1	13.9	4
	54-69	B23t	5.7	TR	5	5.9	5.2	0.2	2.1	2.2	0.7	7.2	20.7	6
	69-80	C	5.6	TR	5	9.4	7.7	0.2	3.3	0.8	0.5	6.4	26.9	7
Guyton silt loam: (S79LA43-13)	0-6	A1	5.0	1.12	5	0.7	0.3	0.1	TR	1.4	0.6	9.6	10.7	1
	6-14	A21g	5.4	0.23	5	1.2	0.3	TR	TR	0.8	0.7	8.0	9.5	1
	14-24	A22g	5.5	TR	5	1.7	0.5	TR	0.1	0.3	0.4	3.9	6.2	3
	24-35	B&A	5.3	0.01	5	2.1	1.3	0.1	1.7	1.6	0.7	13.6	18.8	2
	35-54	B2tg	4.8	TR	5	1.0	1.2	0.1	2.8	1.6	1.0	10.8	15.9	3
	54-65	B3g	5.0	TR	5	0.3	1.2	0.1	3.1	3.0	0.7	6.0	10.7	4
Kisatchie very fine sandy loam: (S80LA43-2)	0-5	A1	4.9	1.07	5	1.5	0.9	0.1	1.8	2.3	0.7	6.4	10.7	4
	5-8	A12	4.9	0.81	5	1.5	1.0	0.1	TR	2.2	0.7	7.6	10.2	2
	8-14	B21t	4.8	0.23	5	3.4	2.6	0.2	TR	5.4	1.1	13.2	19.4	3
	14-24	B22t	4.5	0.09	5	2.3	2.0	0.2	TR	6.6	1.5	13.6	18.2	2

TABLE 20.--CHEMICAL TEST DATA--Continued

Soil sample and number	Depth from surface	Horizon	pH 1:1 H_2O	Organic matter content	P	Exchangeable cations: Ca	Exchangeable cations: Mg	Exchangeable cations: K	Exchangeable cations: Na	Exchangeable cations: Al	Exchangeable cations: H	Extractable acidity	Cation exchange capacity (sum)	Perce bas satura (sum)
	In			Pct	Ppm	------------Meq/100g							------------	
Kolin silt loam: (S79LA43-6)	0-3	A1	5.2	1.70	16	3.6	1.5	0.2	TR	0.3	0.5	7.8	13.1	40
	3-6	A2	5.2	0.88	6	2.5	1.4	0.1	TR	0.3	0.7	2.0	6.0	66
	6-13	B21t	5.3	0.36	5	2.6	2.6	0.1	TR	5.0	1.0	10.7	16.0	33
	13-20	B22t	5.3	0.25	5	2.1	2.6	0.2	0.1	6.8	1.3	15.6	20.6	24
	20-28	B&A'2	5.5	0.12	5	1.3	2.3	0.2	0.2	7.4	1.4	13.6	17.6	22
	28-39	IIB24t	5.5	0.09	5	1.3	2.3	0.2	0.2	10.2	1.8	19.4	24.4	20
	39-49	IIB25t	5.5	0.02	9	2.5	3.3	0.3	0.4	9.5	0.8	16.0	24.4	34
	49-74	IIB3t	5.2	0.02	5	4.4	5.2	0.2	0.7	4.2	0.9	10.0	22.4	55
Latanier clay: (S79LA43-7)	0-6	Ap	6.8	2.10	117	19.3	7.5	0.5	0.2	0.0	0.2	6.8	34.3	80
	6-25	B21	8.1	0.36	192	29.5	7.2	0.4	0.3	0.0	0.3	2.9	40.3	90
	25-34	B22	8.1	0.33	183	31.6	10.0	0.5	0.4	0.0	0.2	1.9	44.4	95
	34-54	IIC1	7.9	0.12	66	7.5	2.8	0.2	0.1	0.0	0.2	0.0	10.6	100
	54-65	IIC2	7.9	0.02	70	5.0	2.1	0.2	0.1	0.0	0.2	0.0	7.4	100
Mayhew silty clay loam: (S79LA43-8)	0-5	Ap	4.6	1.49	5	5.7	2.4	0.2	0.1	1.4	0.6	9.6	18.0	46
	5-20	B21tg	5.0	0.07	5	2.6	2.3	0.2	0.2	11.0	3.2	16.8	22.1	24
	20-35	B22tg	5.1	0.01	5	1.3	2.4	0.2	0.4	11.8	1.4	20.1	24.4	17
	35-60	B23tg	5.0	0.01	5	2.0	3.3	0.2	0.7	12.2	1.8	26.1	32.3	19
	60-75	B3g	4.6	TR	5	4.6	5.9	0.4	1.7	14.8	1.2	30.5	43.1	29
Moreland clay: (S78LA43-3)	0-4	Ap	7.1	1.70	161	27.8	7.2	0.9	0.1	0.0	0.3	6.8	42.8	84
	4-10	A1	7.7	1.78	112	28.5	6.7	0.6	0.1	0.0	0.3	7.8	43.7	82
	10-19	B21	7.8	0.23	195	26.3	8.3	0.6	0.3	0.0	0.2	7.6	43.1	82
	19-31	B22	7.8	0.15	233	31.5	10.4	0.6	0.4	0.0	0.3	4.4	47.3	90
	31-46	B31	7.9	0.23	229	31.7	11.8	0.6	0.8	0.0	0.2	4.8	49.7	90
	46-66	B32	7.8	0.28	199	29.7	15.0	0.6	1.5	0.0	0.2	3.6	50.4	92
Norwood silt loam: (S79LA43-9)	0-8	Ap	7.4	0.44	248	9.3	1.5	0.6	0.1	0.0	0.2	2.0	13.5	85
	8-20	B2	8.1	0.07	131	23.0	3.8	0.2	0.1	0.0	0.3	3.9	31.0	87
	20-33	C1	8.2	0.07	130	21.9	4.2	0.2	0.1	0.0	0.2	1.9	28.3	93
	33-46	C2	8.2	0.01	120	19.9	3.6	0.2	0.2	0.0	0.2	1.0	24.9	96
	46-66	C3	8.1	0.07	103	24.2	6.3	0.3	0.2	0.0	0.2	1.6	32.6	95
Rigolette loamy fine sand: (S80LA43-1)	0-4	A1	5.1	0.57	7	0.4	0.1	TR	TR	0.6	0.7	9.3	9.8	5
	4-12	A2	5.2	0.07	5	0.5	0.3	TR	TR	1.5	0.7	8.7	9.5	8
	12-17	B1	5.0	0.09	5	1.0	0.7	0.1	0.1	3.0	0.7	9.3	11.2	17
	17-22	B21tg	5.0	0.12	5	1.4	1.4	0.1	0.1	4.2	1.0	14.0	17.0	17
	22-32	B22tg	5.0	0.15	5	1.5	1.6	0.1	0.1	4.4	0.5	14.0	17.3	19
	32-37	IIB23tgb	4.7	0.12	5	5.1	6.1	0.3	0.3	9.1	1.2	22.3	34.1	34
	37-49	IIC1g	4.7	0.09	5	5.5	6.3	0.3	0.3	9.0	1.0	28.6	41.0	30
	49-61	IIC2g	4.9	0.04	5	3.1	3.3	0.2	0.2	3.2	0.8	14.6	21.4	31
	61-75	IIC3g	4.5	0.02	5	8.0	8.0	0.4	0.4	5.7	1.0	15.5	32.3	52
Roxana very fine sandy loam: (S78LA43-4)	0-6	Ap	7.2	0.57	254	6.8	1.7	0.5	TR	0.0	0.0	0.0	9.0	100
	6-15	C1	8.0	0.17	146	9.5	1.3	0.2	TR	0.0	0.9	0.0	11.0	100
	15-26	C2	8.4	0.02	101	9.0	1.0	0.1	TR	0.0	0.0	0.0	10.1	100
	26-44	C3	8.4	0.09	98	14.6	2.0	0.1	TR	0.0	0.0	0.0	16.7	100
	44-65	C4	8.4	0.01	118	3.9	1.4	TR	0.1	0.0	0.0	0.0	5.4	100
Smithdale fine sandy loam: (S79LA43-10)	0-7	A1	4.5	1.81	8	1.0	0.3	0.1	TR	2.0	0.4	11.4	12.9	11
	7-13	A2	5.2	0.78	5	1.0	0.5	TR	0.1	0.8	0.5	5.8	7.4	21
	13-30	B21t	5.4	0.17	5	0.5	1.1	0.1	0.1	5.8	0.6	10.7	12.5	14
	30-57	B22t	5.3	0.07	5	0.2	0.5	0.1	0.1	5.0	0.6	8.9	9.8	9
	57-80	B23t	5.3	0.54	5	0.2	0.3	0.1	TR	3.2	0.5	9.7	10.3	8

TABLE 21.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Armistead	Fine-silty, mixed, thermic Aquic Argiudolls
Briley	Loamy, siliceous, thermic Arenic Paleudults
Caddo	Fine-silty, siliceous, thermic Typic Glossaqualfs
Cadeville	Fine, mixed, thermic Albaquic Hapludalfs
Cahaba	Fine-loamy, siliceous, thermic Typic Hapludults
Cascilla	Fine-silty, mixed, thermic Fluventic Dystrochrepts
Gallion	Fine-silty, mixed, thermic Typic Hapludalfs
Glenmora	Fine-silty, siliceous, thermic Glossaquic Paleudalfs
Gore	Fine, mixed, thermic Vertic Paleudalfs
Guyton	Fine-silty, siliceous, thermic Typic Glossaqualfs
Kisatchie	Fine, montmorillonitic, thermic Typic Hapludalfs
Kolin	Fine-silty, siliceous, thermic Glossaquic Paleudalfs
*Latanier	Clayey over loamy, mixed, thermic Vertic Hapludolls
Malbis	Fine-loamy, siliceous, thermic Plinthic Paleudults
*Mayhew	Fine, montmorillonitic, thermic Vertic Ochraqualfs
Metcalf	Fine-silty, siliceous, thermic Aquic Glossudalfs
Moreland	Fine, mixed, thermic Vertic Hapludolls
Norwood	Fine-silty, mixed (calcareous), thermic Typic Udifluvents
Rigolette	Fine-loamy, siliceous, thermic Typic Ochraqualfs
Roxana	Coarse-silty, mixed, nonacid, thermic Typic Udifluvents
Ruston	Fine-loamy, siliceous, thermic Typic Paleudults
Smithdale	Fine-loamy, siliceous, thermic Typic Paleudults
Sumter Variant	Fine-silty, carbonatic, thermic Rendollic Eutrochrepts
Una	Fine, mixed, acid, thermic Typic Haplaquepts
Urbo Variant	Fine-silty, mixed, acid, thermic Aeric Haplaquepts
Vaiden	Very-fine, montmorillonitic, thermic Vertic Hapludalfs
Yorktown	Very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents

* The soil is a taxadjunct to the series. See the section "Soil Series and Their Morphology" for a description of those characteristics of the soil that are outside the range of the series.

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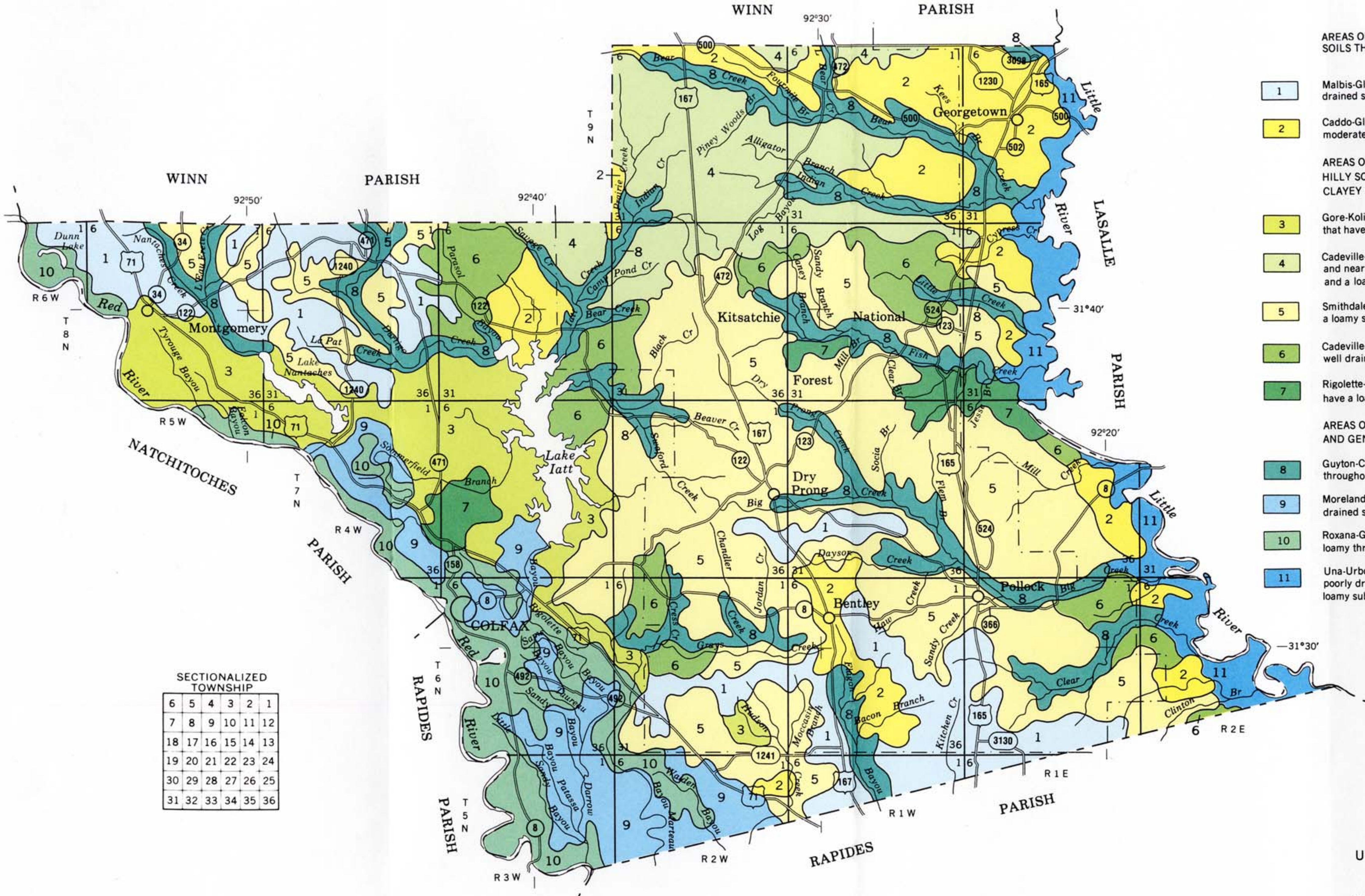


LEGEND

AREAS ON TERRACE UPLANDS DOMINATED BY LEVEL TO GENTLY SLOPING SOILS THAT HAVE A LOAMY SURFACE LAYER AND SUBSOIL

1 Malbis-Glenmora: Gently sloping and very gently sloping, moderately well drained soils

2 Caddo-Glenmora-Guyton: Level, poorly drained soils and very gently sloping, moderately well drained soils

AREAS ON TERRACE UPLANDS DOMINATED BY VERY GENTLY SLOPING TO HILLY SOILS THAT HAVE A LOAMY SURFACE LAYER AND A LOAMY OR CLAYEY SUBSOIL

3 Gore-Kolin: Very gently sloping to strongly sloping, moderately well drained soils that have a loamy surface layer and a loamy and clayey subsoil

4 Cadeville-Metcalf: Nearly level to strongly sloping, moderately well drained soils and nearly level, somewhat poorly drained soils that have a loamy surface layer and a loamy or clayey subsoil

5 Smithdale-Ruston: Gently sloping to strongly sloping, well drained soils that have a loamy surface layer and a loamy subsoil

6 Cadeville-Ruston: Gently sloping to strongly sloping, moderately well drained and well drained soils that have a loamy surface layer and a clayey or loamy subsoil

7 Rigolette-Kisatchie: Hilly, somewhat poorly drained and well drained soils that have a loamy or sandy surface layer and a loamy or clayey subsoil

AREAS ON FLOOD PLAINS AND NATURAL LEVEES DOMINATED BY LEVEL AND GENTLY UNDULATING, LOAMY AND CLAYEY SOILS

8 Guyton-Cascilla: Level, poorly drained and well drained soils that are loamy throughout

9 Moreland-Armistead-Latanier: Level and gently undulating, somewhat poorly drained soils that have a clayey or loamy surface layer and a clayey or loamy subsoil

10 Roxana-Gallion-Norwood: Level and gently undulating, well drained soils that are loamy throughout

11 Una-Urbo Variant: Level and very gently sloping, poorly drained and somewhat poorly drained soils that have a clayey or loamy surface layer and a clayey or loamy subsoil

Compiled 1983

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE
LOUISIANA AGRICULTURAL EXPERIMENT STATION
LOUISIANA STATE SOIL AND WATER CONSERVATION COMMITTEE

GENERAL SOIL MAP
GRANT PARISH, LOUISIANA

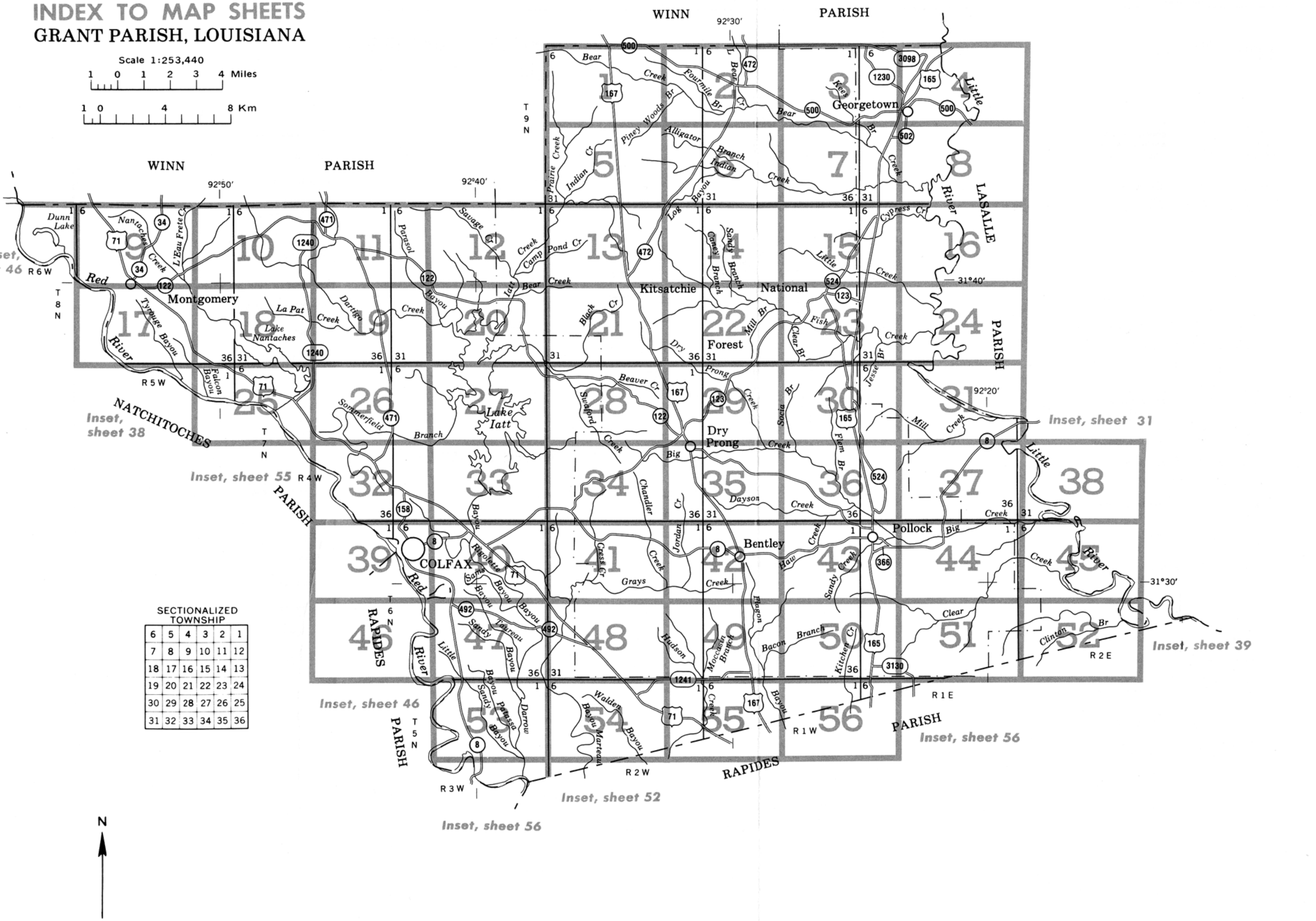
Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS
GRANT PARISH, LOUISIANA



GRANT PARISH, LOUISIANA NO. 1

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1

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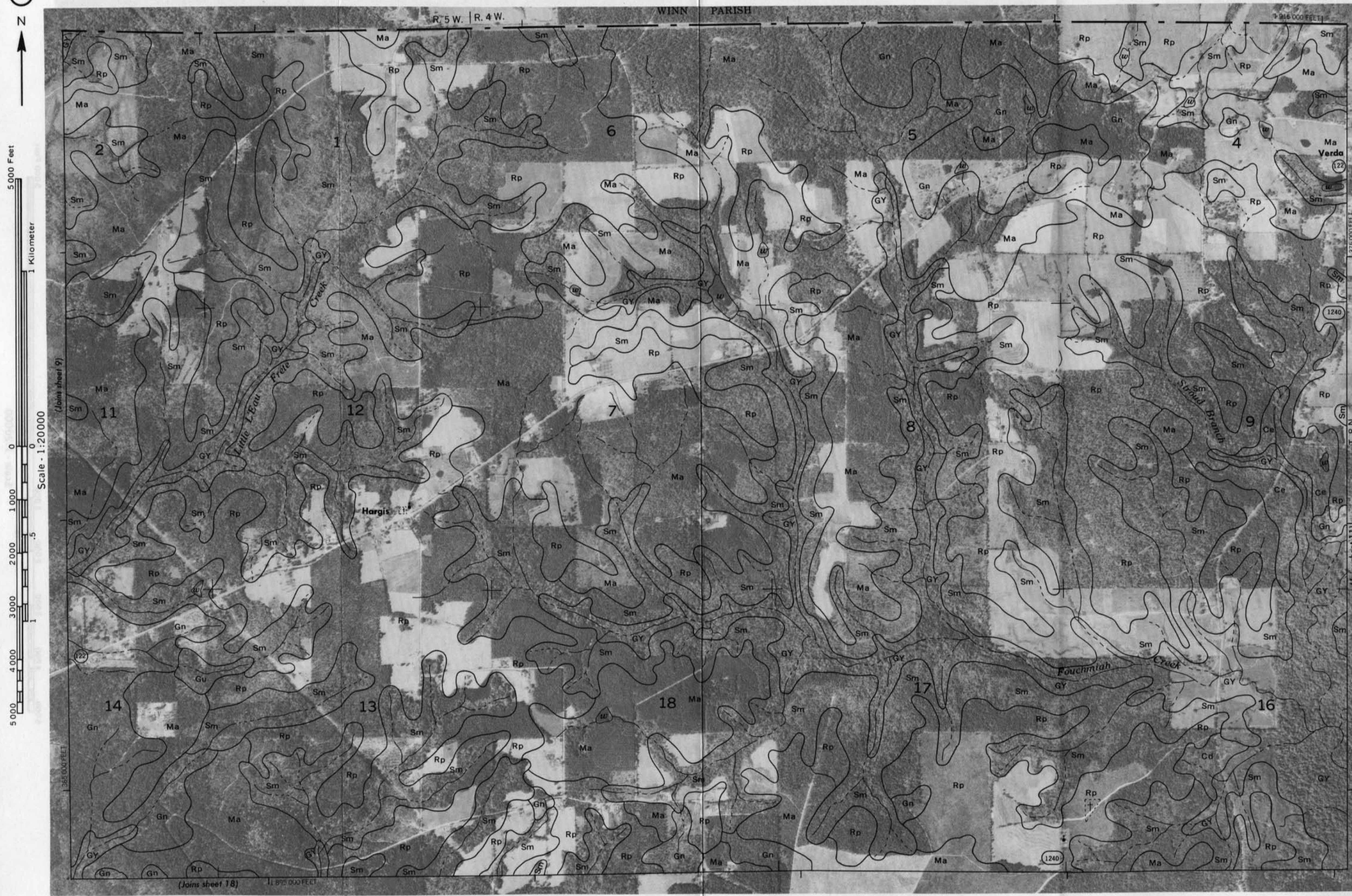

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GRANT PARISH, LOUISIANA — SHEET NUMBER 11

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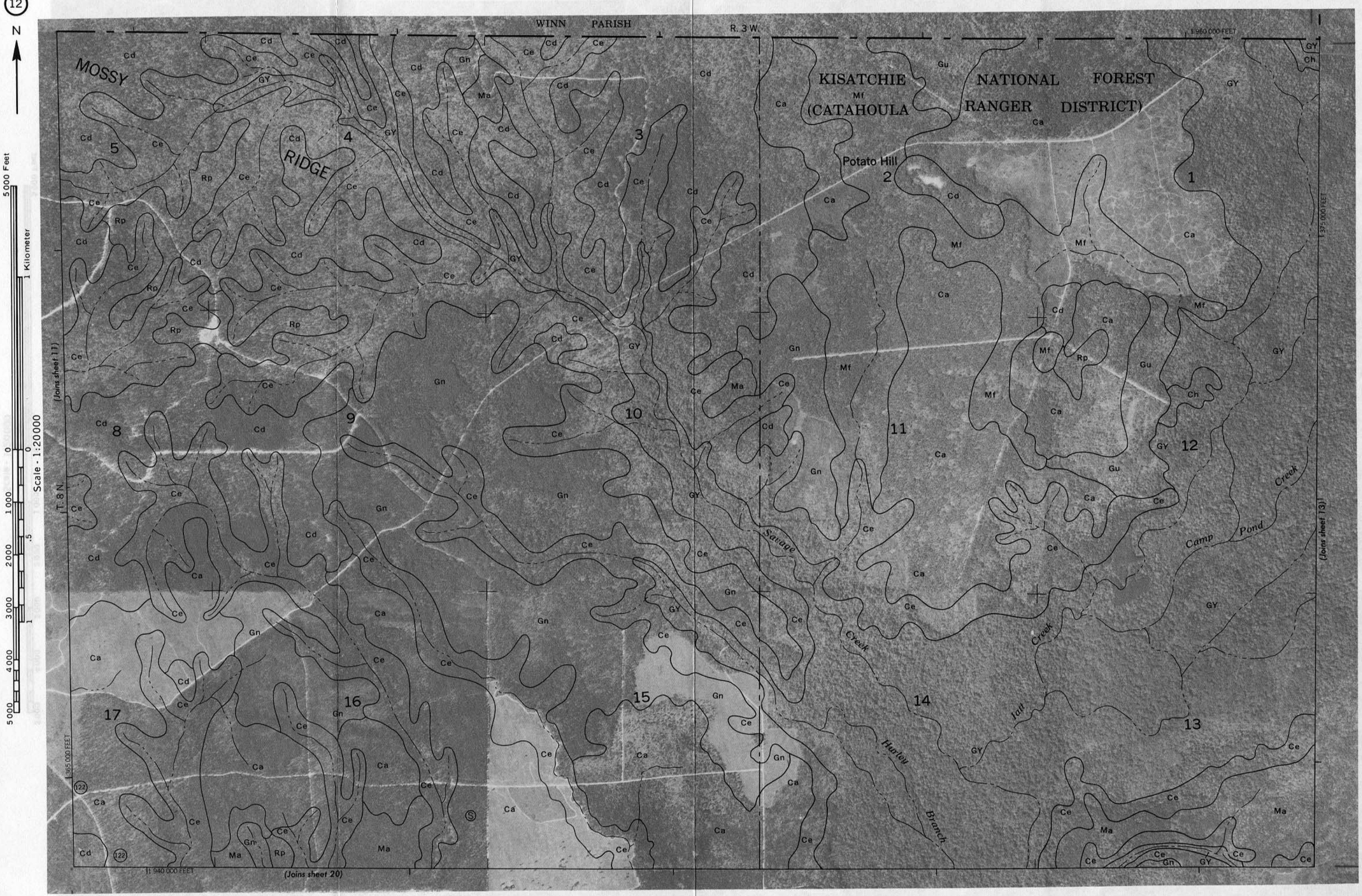

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GRANT PARISH, LOUISIANA NO. 13

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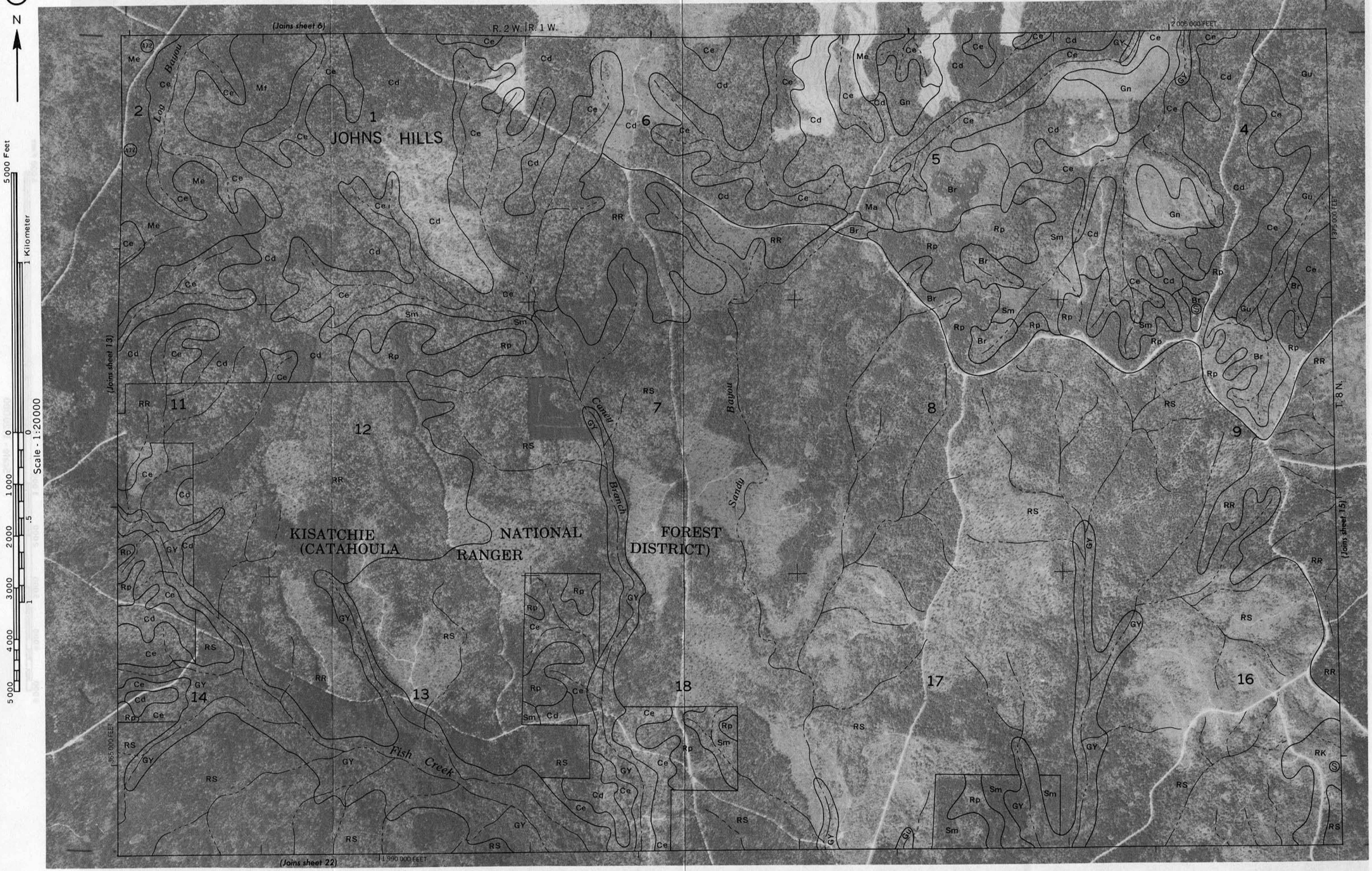

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GRANT PARISH, LOUISIANA NO. 15

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GRANT PARISH, LOUISIANA NO. 17

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17

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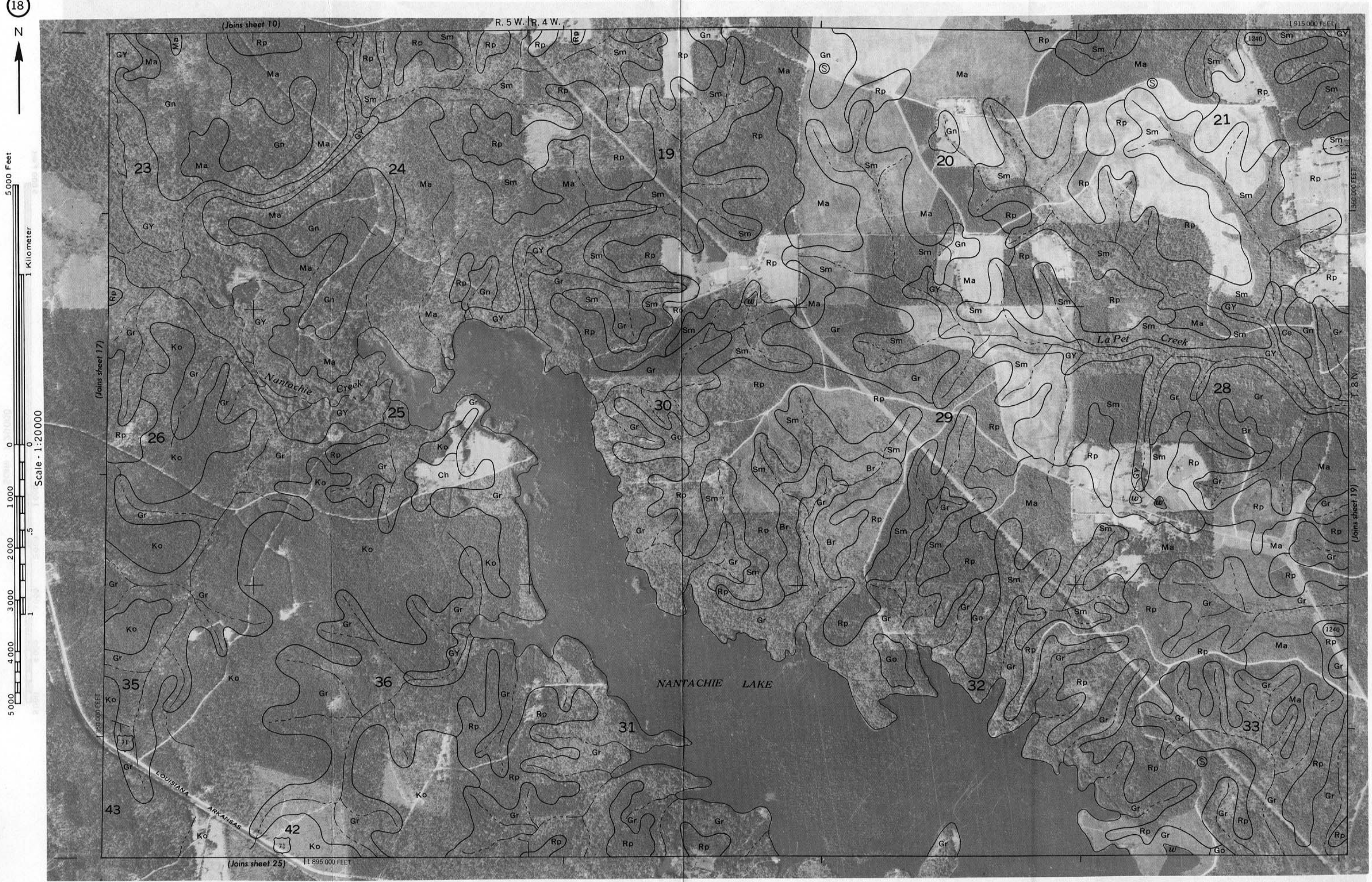
5 000 Feet

1 Kilometer

Scale - 1:20000



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GRANT PARISH, LOUISIANA NO. 19

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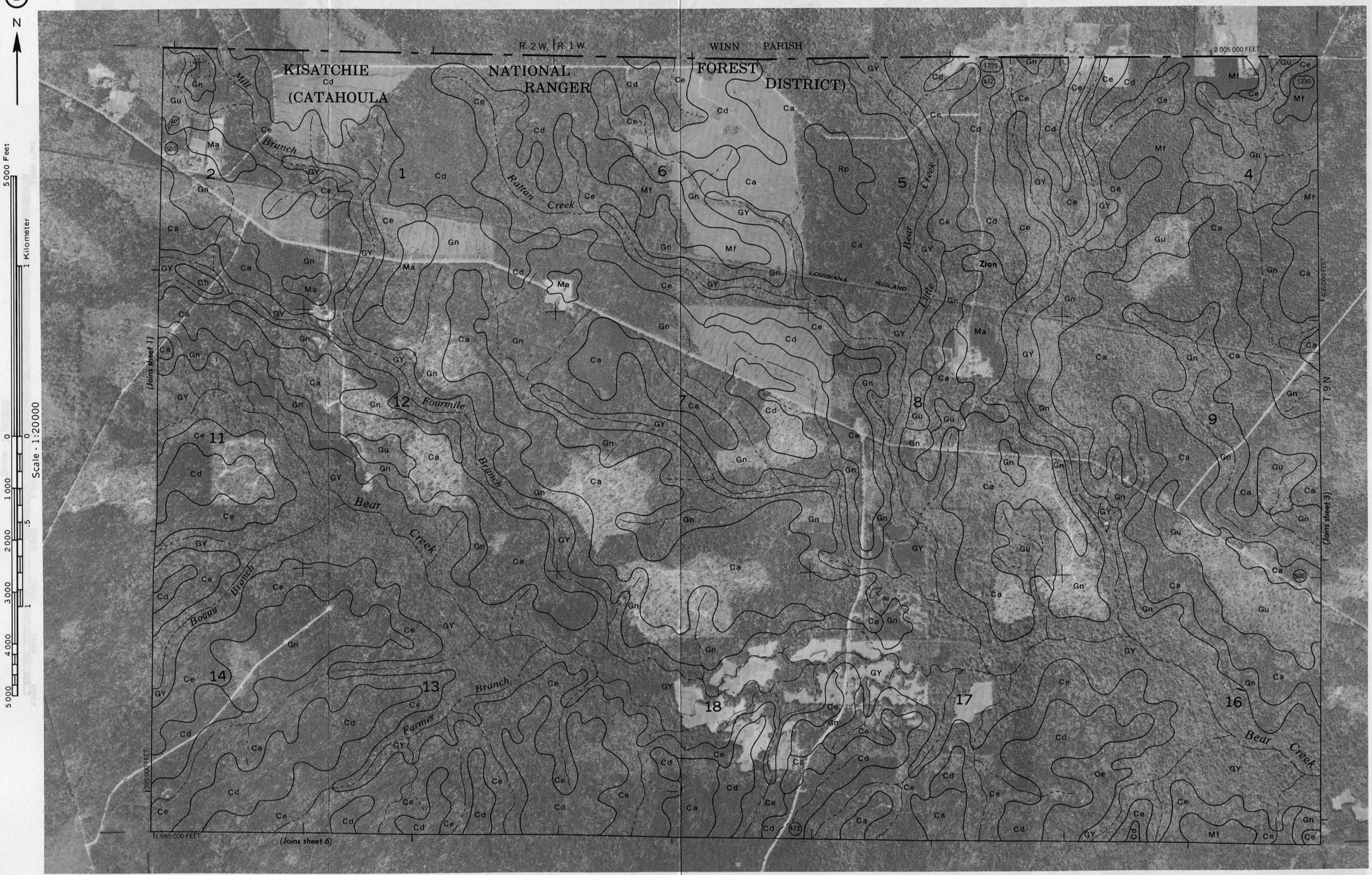

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GRANT PARISH, LOUISIANA NO. 21

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GRANT PARISH, LOUISIANA NO. 22

23

N

5000 Feet
1 Kilometer
Scale - 1:20000

GRANT PARISH, LOUISIANA NO. 23

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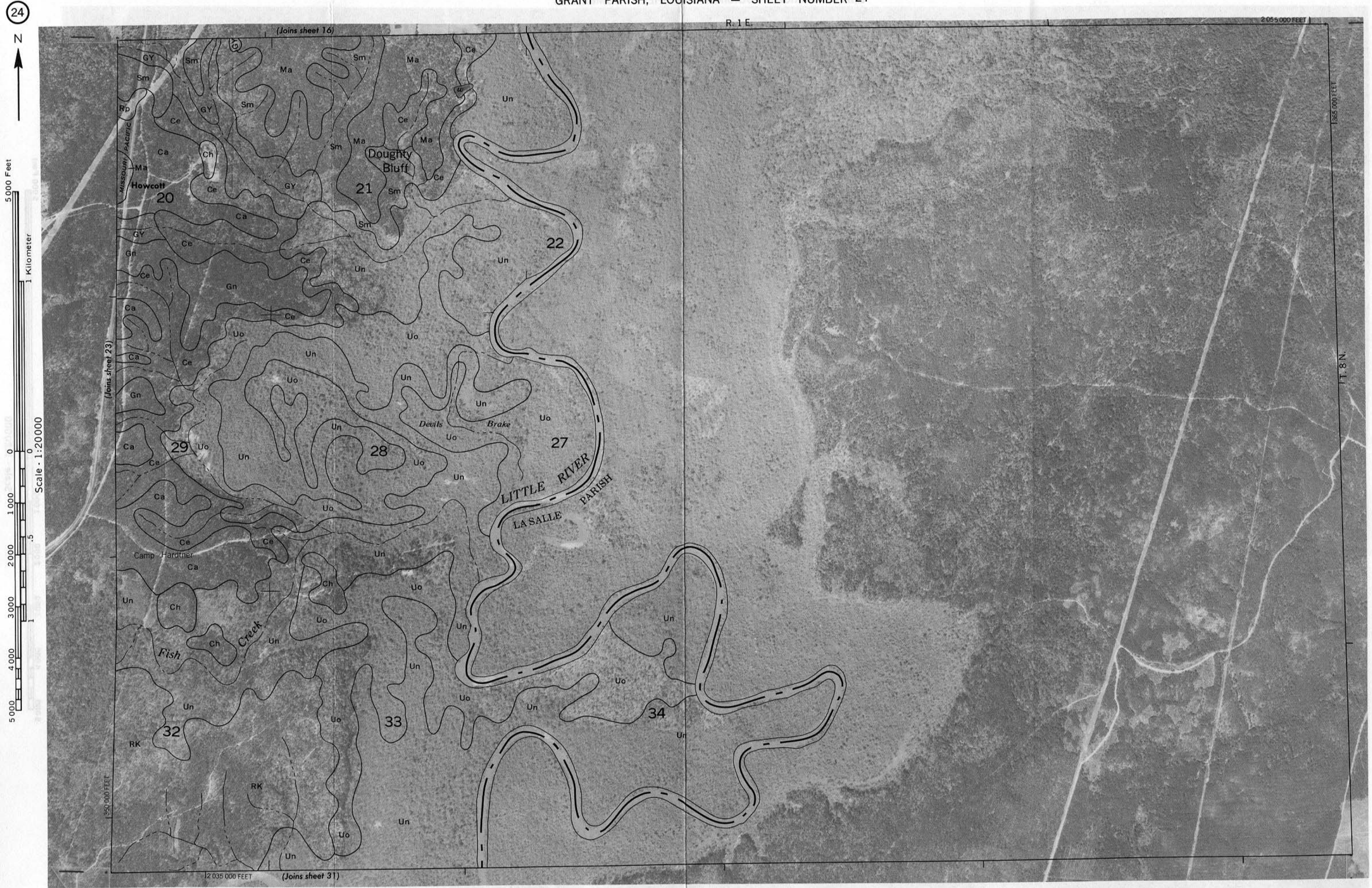

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GRANT PARISH, LOUISIANA NO. 24

GRANT PARISH, LOUISIANA NO. 25

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26

N

5 000 Feet

1 Kilometer

Scale - 1:20000

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(27)

GRANT PARISH, LOUISIANA NO. 27

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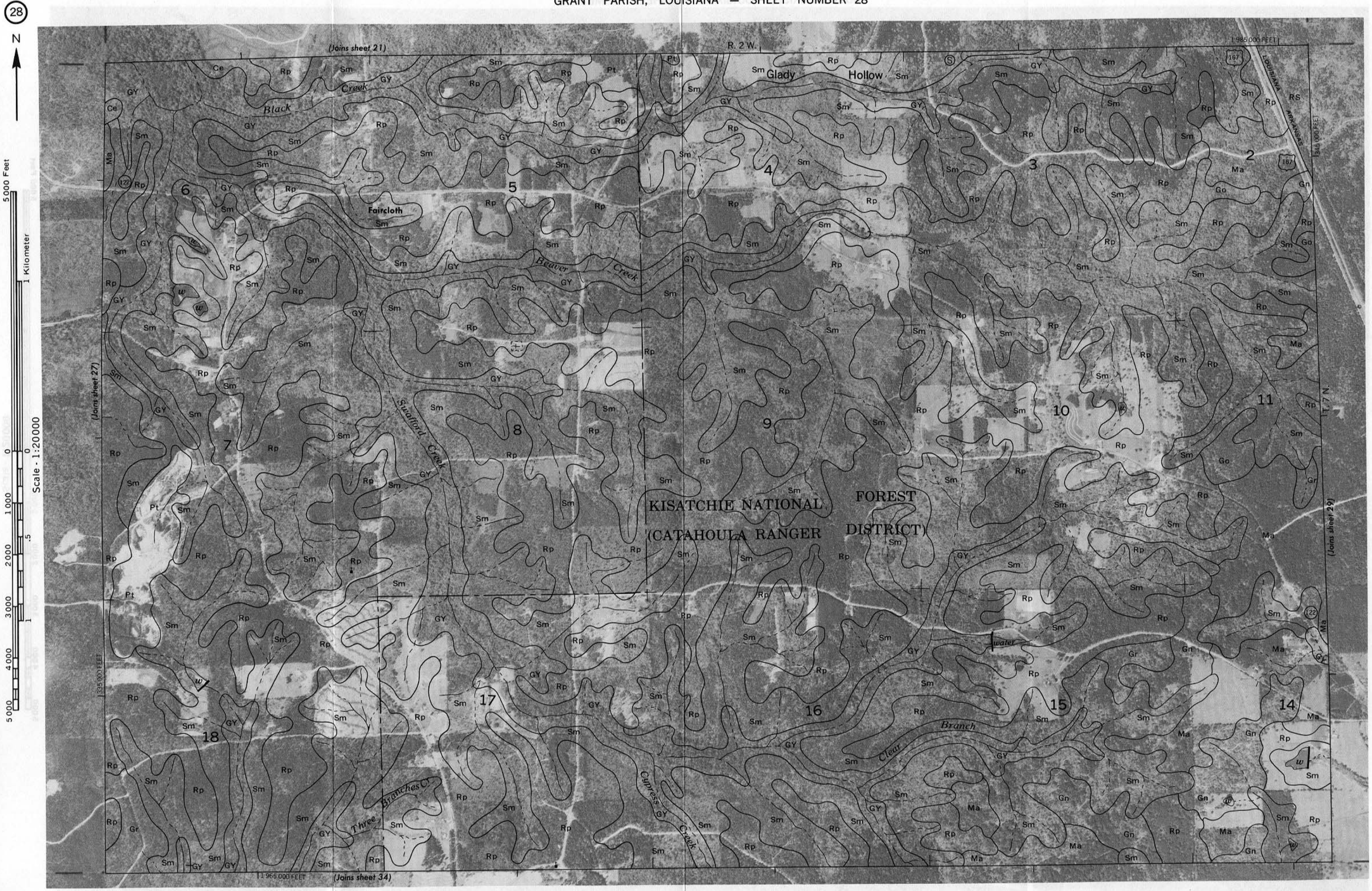
5000 Feet

1 Kilometer

Scale - 1:20000



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GRANT PARISH, LOUISIANA NO. 29

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GRANT PARISH, LOUISIANA NO. 3

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3

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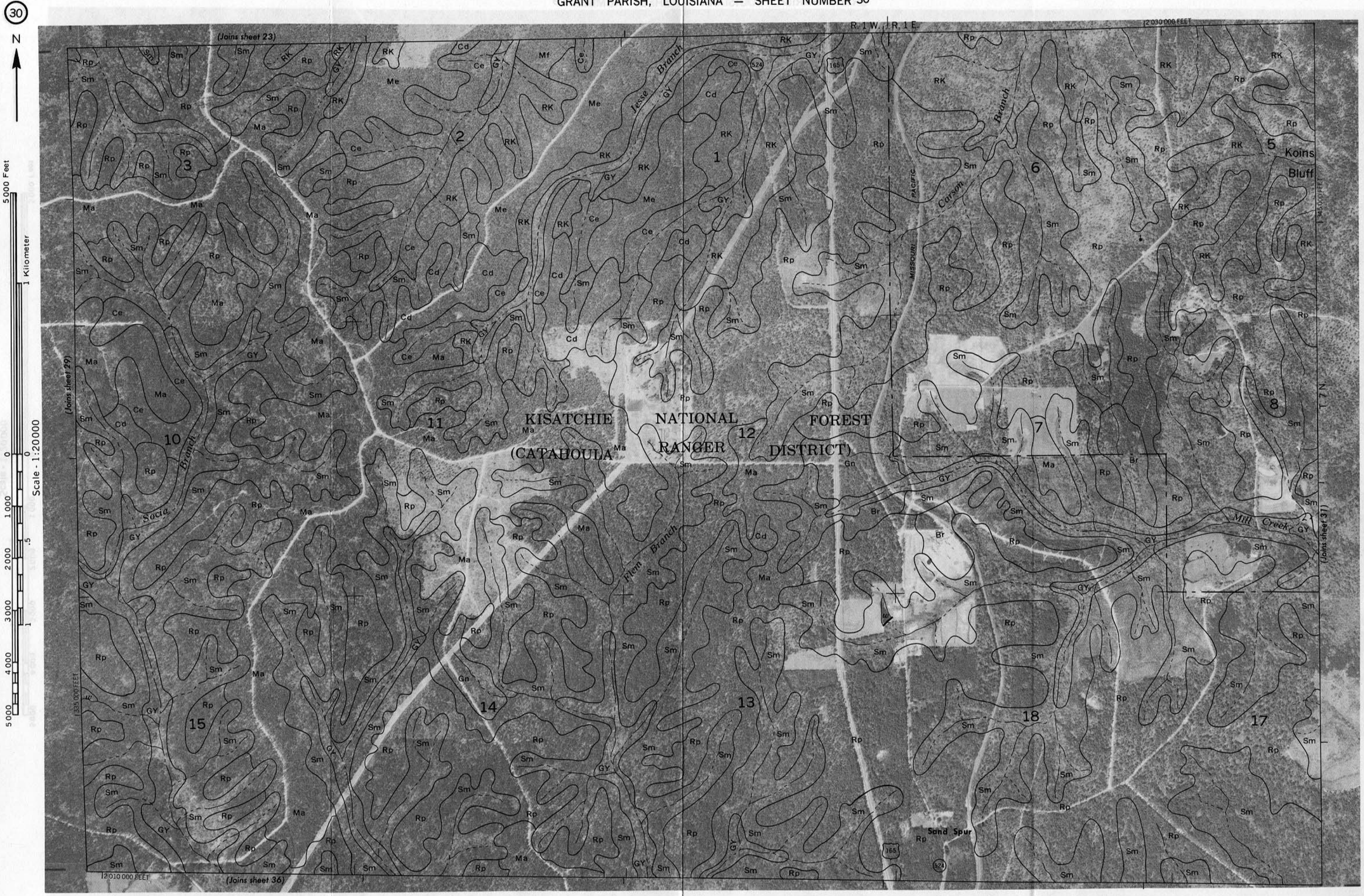
5000 Feet
1 Kilometer
Scale - 1:20000



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GRANT PARISH, LOUISIANA NO. 33

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34

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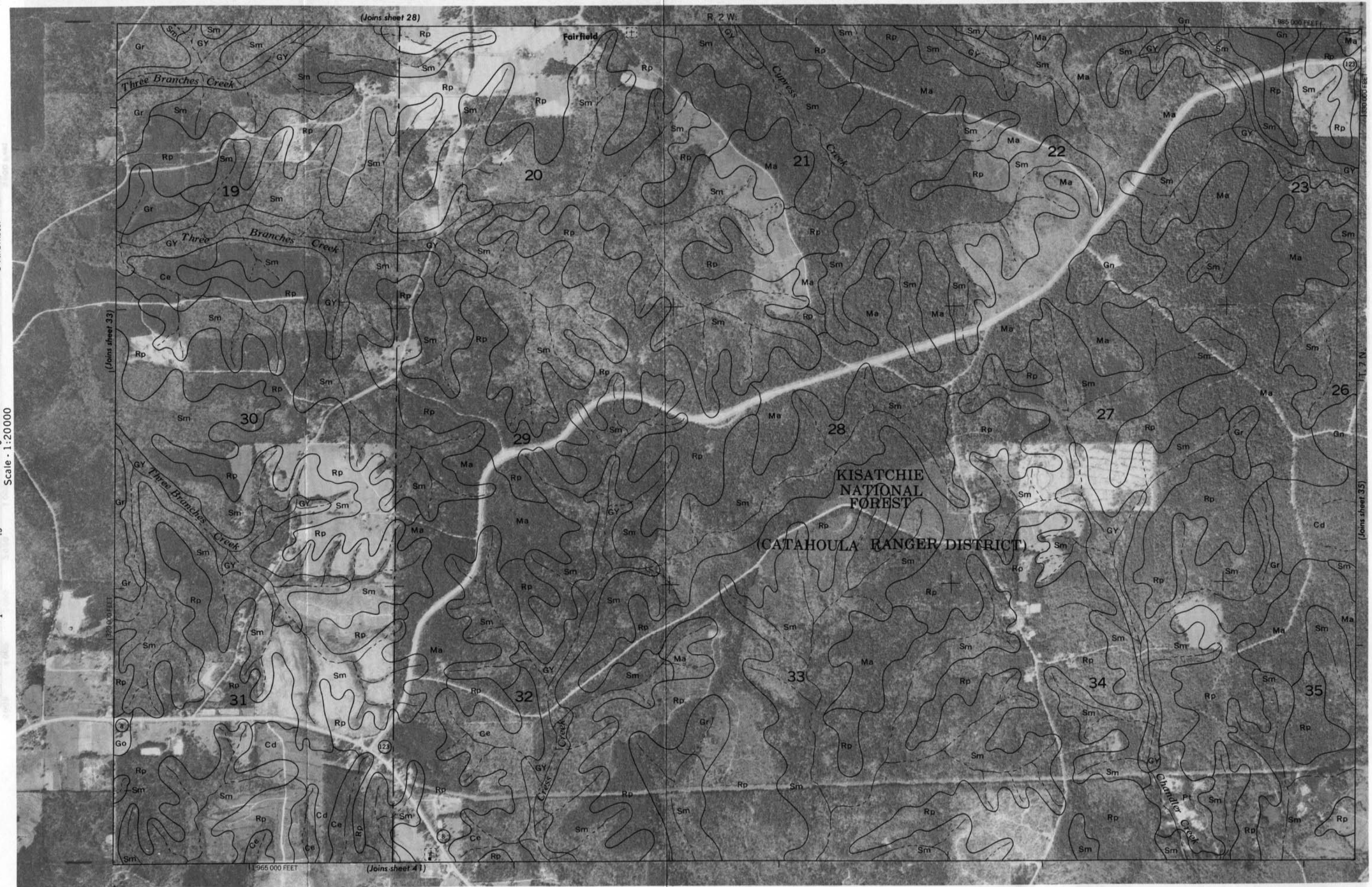

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0 1000 2000 3000 4000 5000

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GRANT PARISH, LOUISIANA — SHEET NUMBER 35

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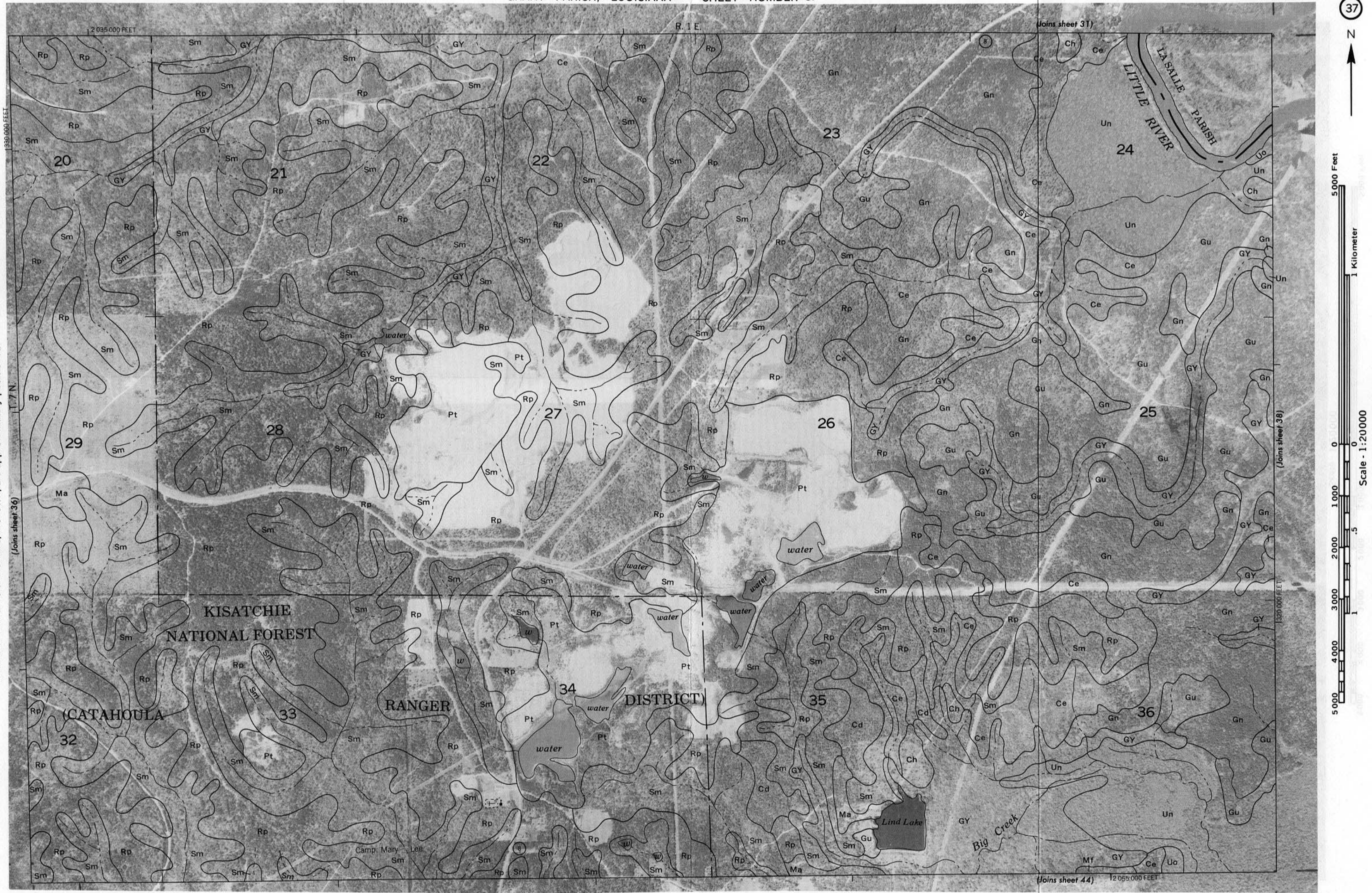

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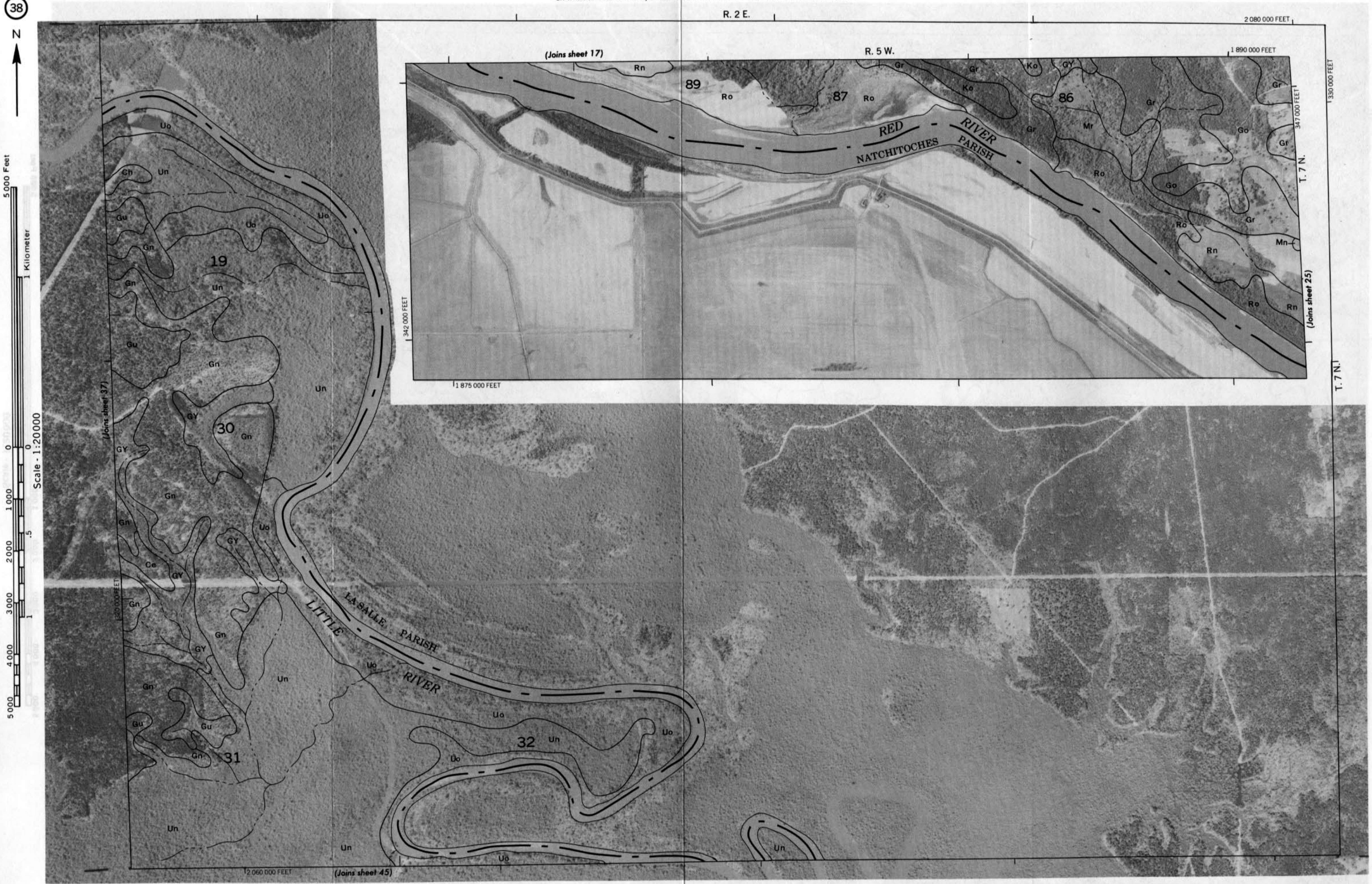

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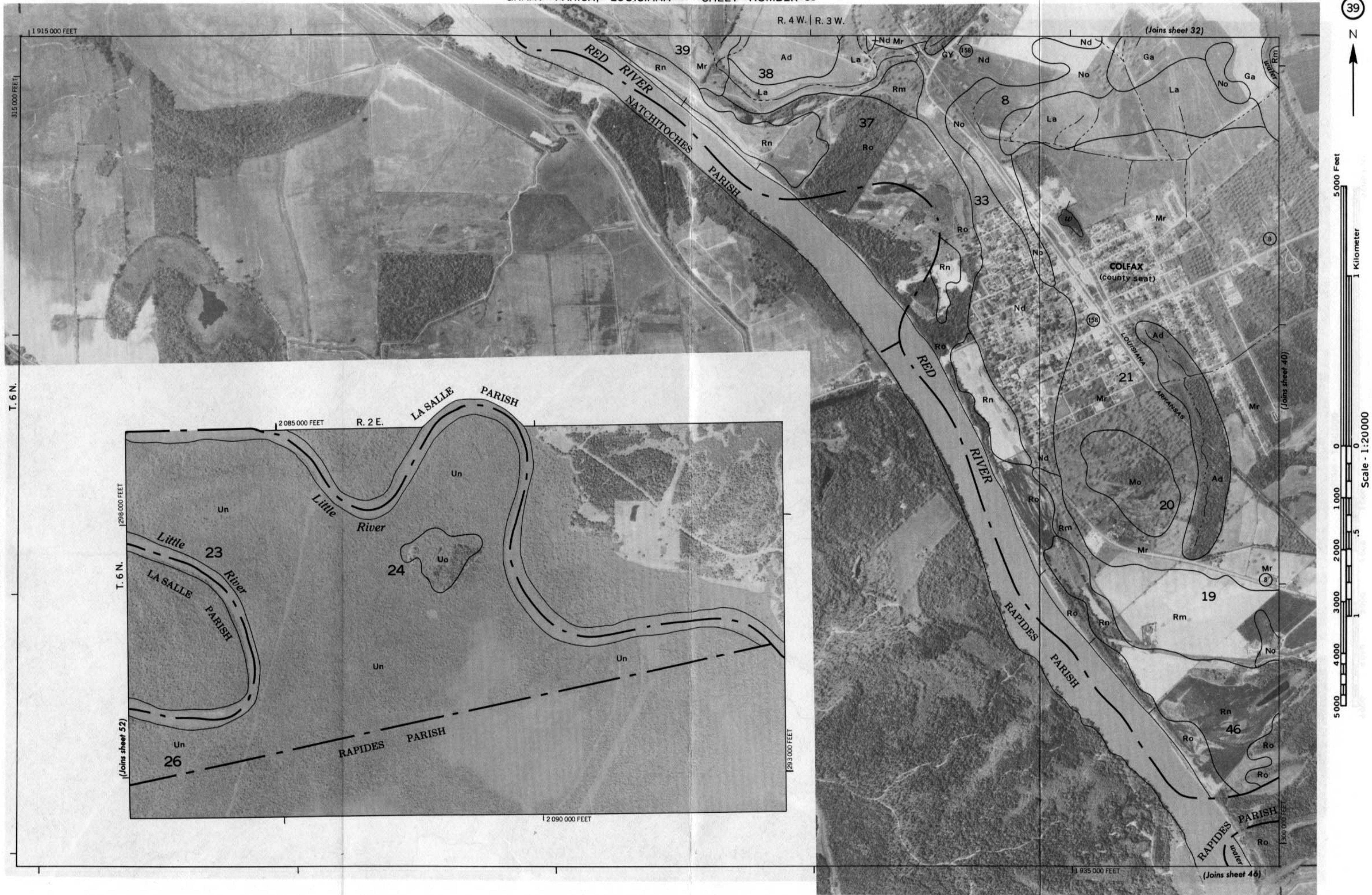

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GRANT PARISH, LOUISIANA — SHEET NUMBER 4

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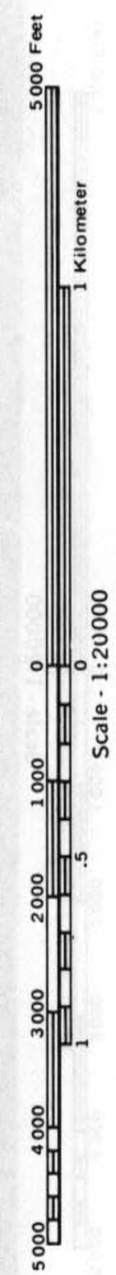
41

GRANT PARISH, LOUISIANA NO. 41

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GRANT PARISH, LOUISIANA NO. 43

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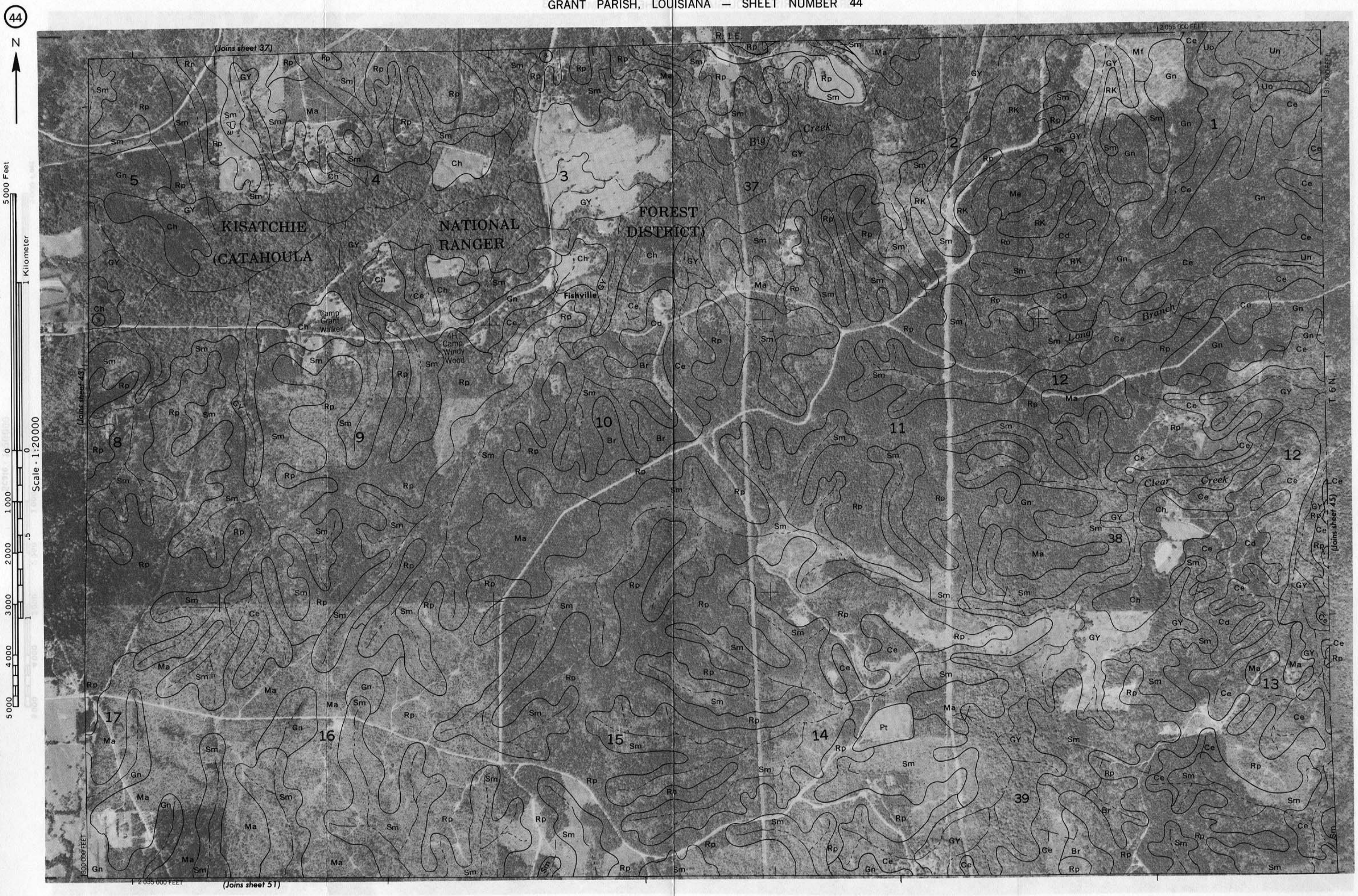

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GRANT PARISH, LOUISIANA NO. 45

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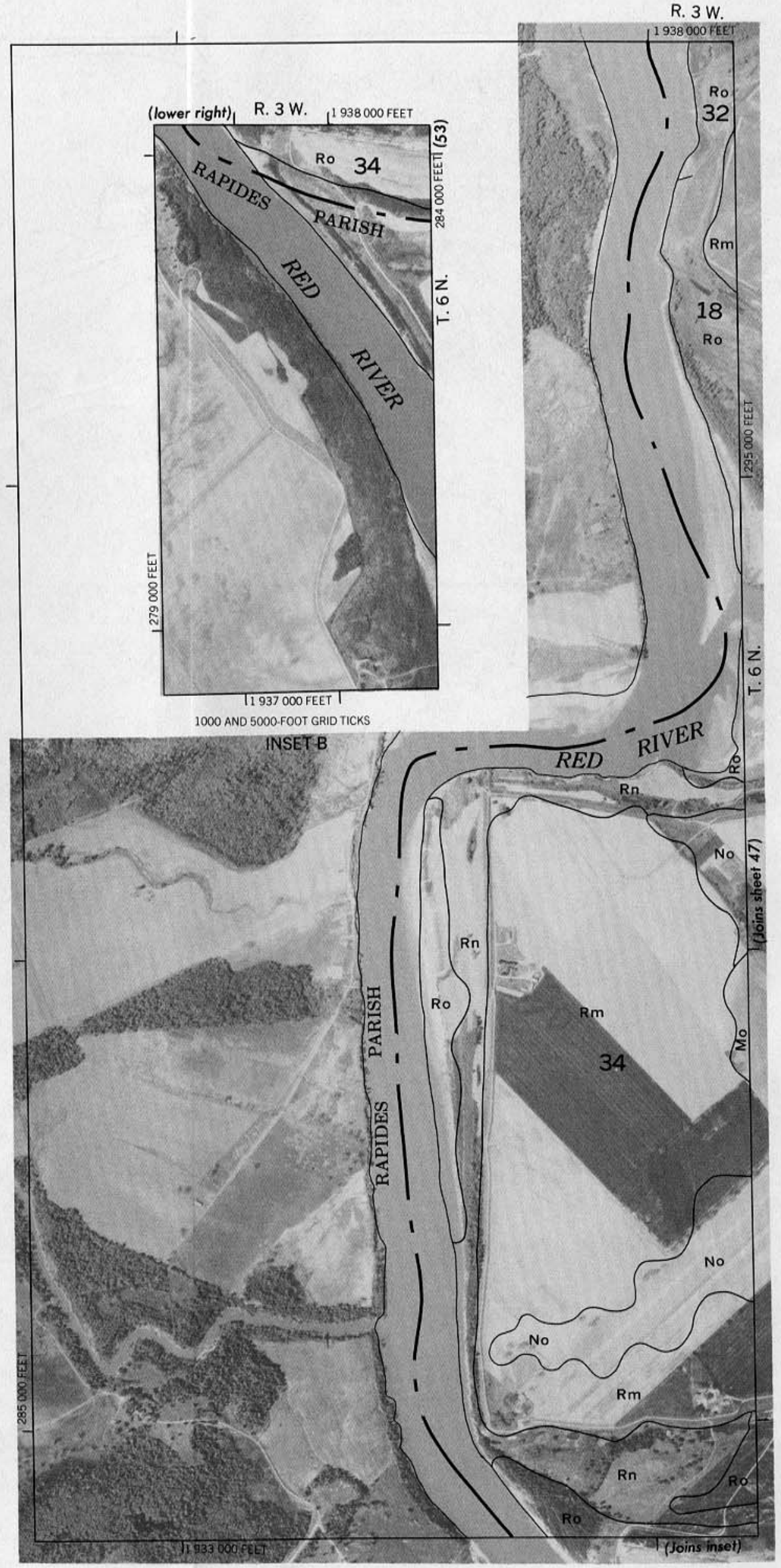

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GRANT PARISH, LOUISIANA NO. 47

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49

N

5000 Feet

1 Kilometer

Scale - 1:20000

GRANT PARISH, LOUISIANA NO. 49

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GRANT PARISH, LOUISIANA NO. 5

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GRANT PARISH, LOUISIANA — SHEET NUMBER 50

N

5000 Feet

1 Kilometer

Scale - 1:20000

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This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(53)

GRANT PARISH, LOUISIANA NO. 53

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N

Scale - 1:20000

5000 Feet
1 Kilometer

GRANT PARISH, LOUISIANA — SHEET NUMBER 54

N

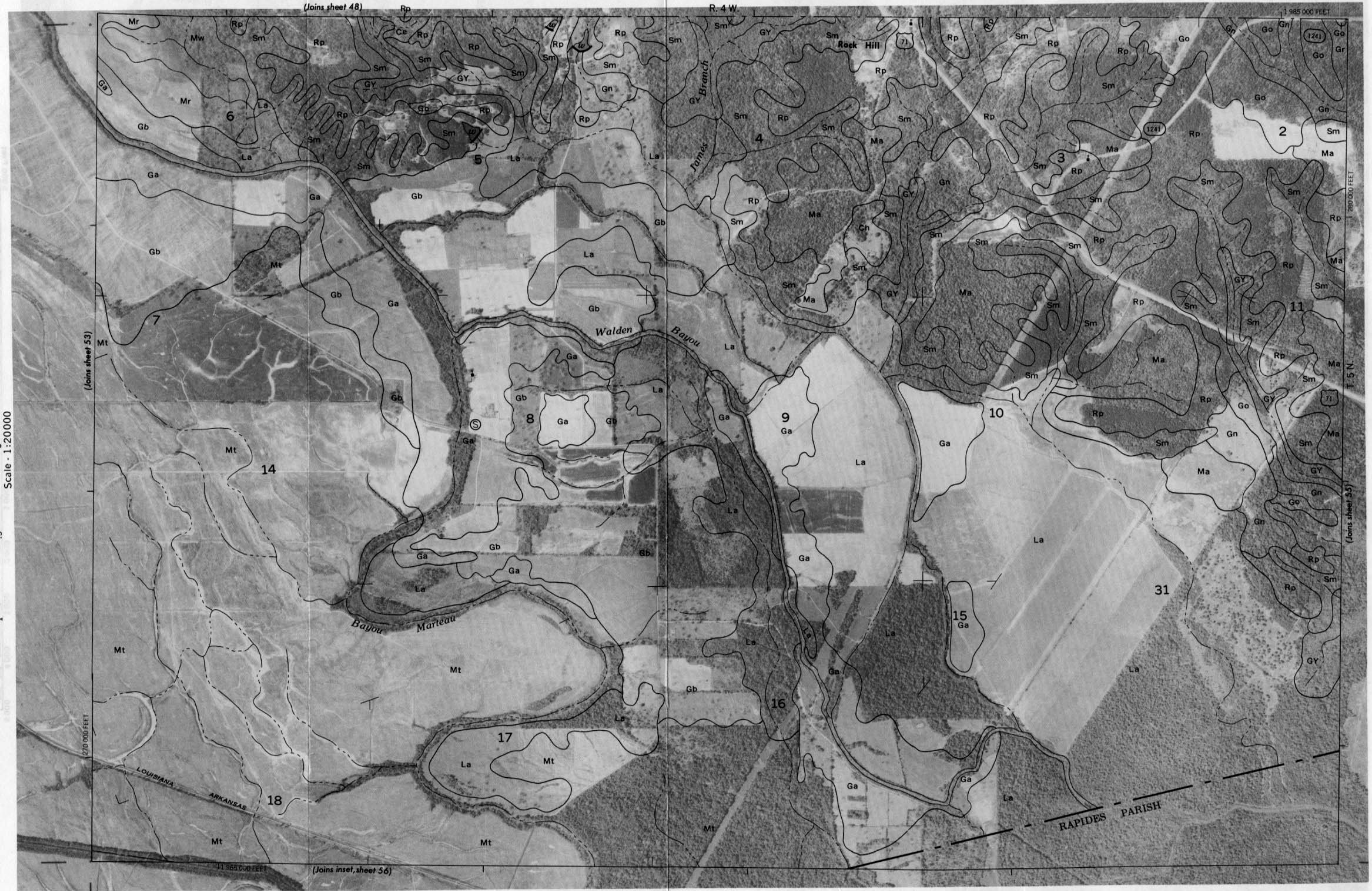
5000 Feet

1 Kilometer

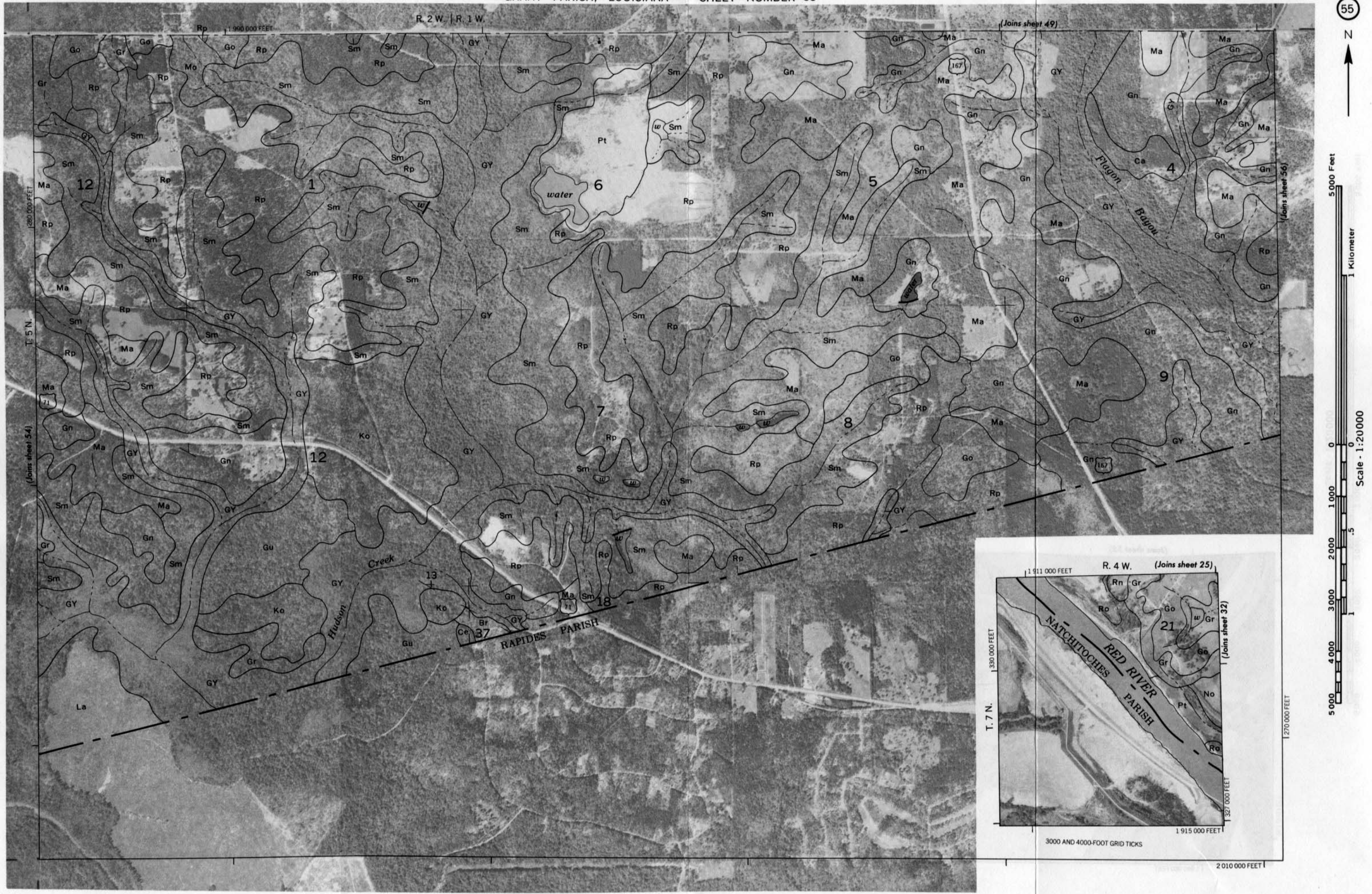
Scale - 1:20000

0 1000 2000 3000 4000 5000

0 .5 1



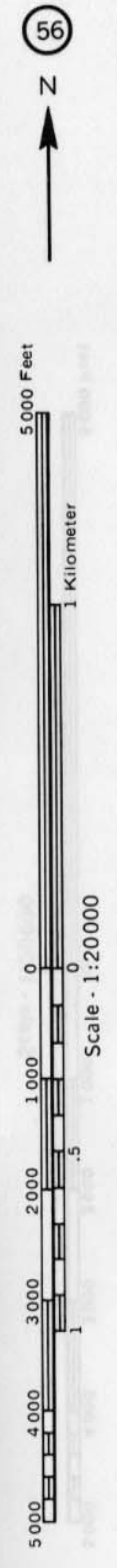
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

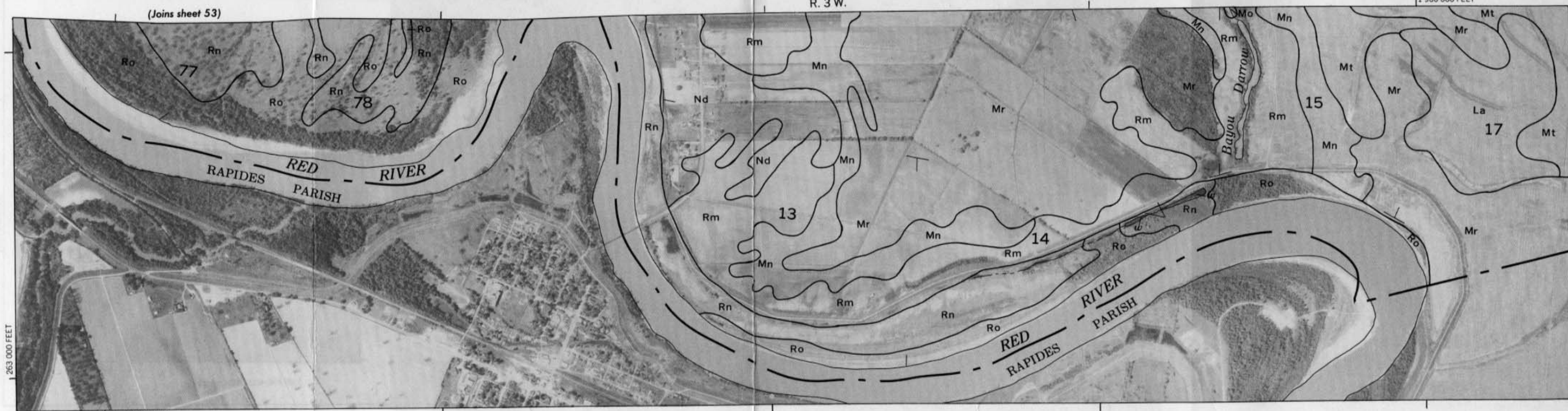


GRANT PARISH, LOUISIANA NO. 55

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

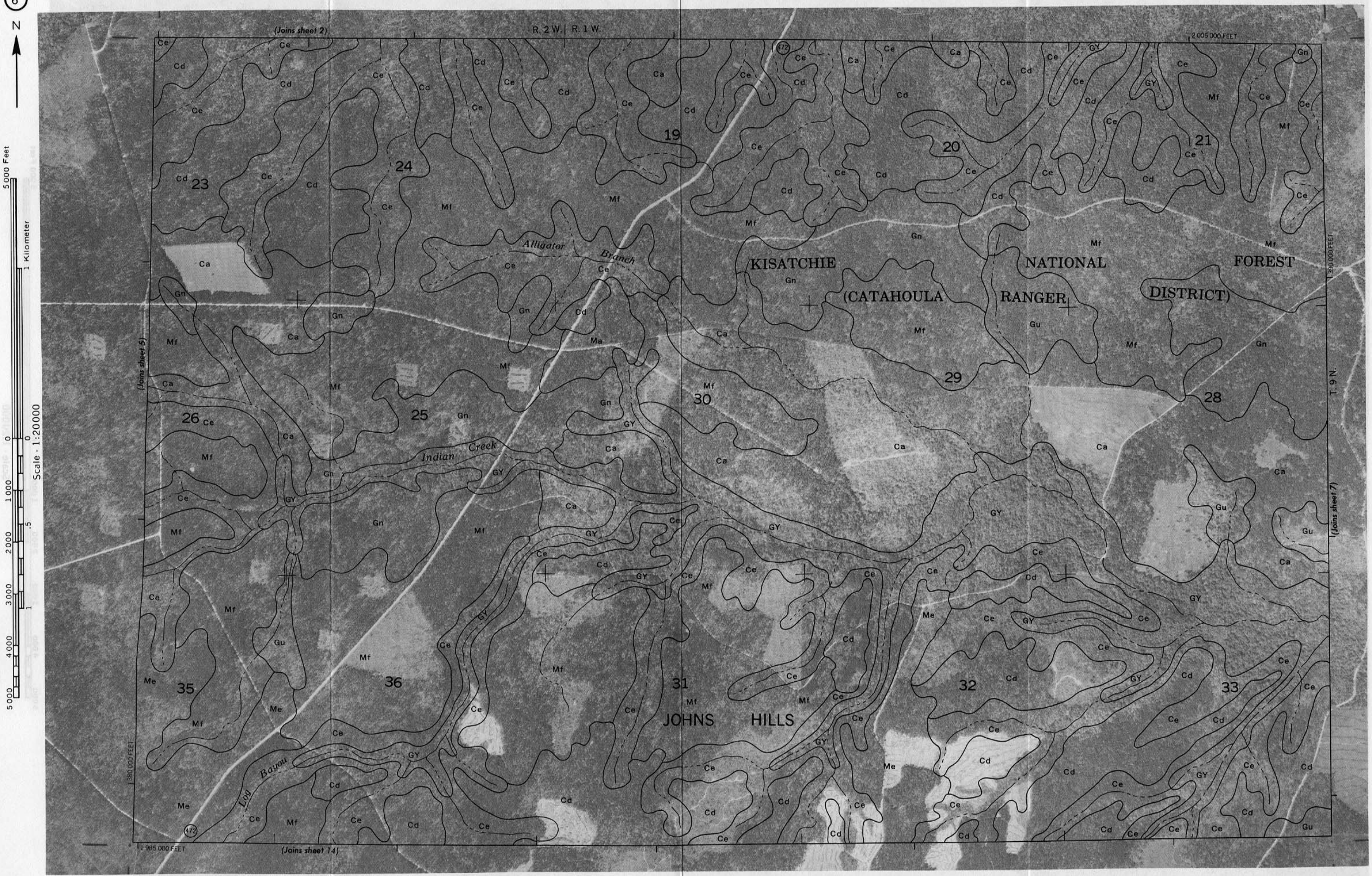
GRANT PARISH, LOUISIANA — SHEET NUMBER 56





This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GRANT PARISH, LOUISIANA — SHEET NUMBER 6



This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

7

GRANT PARISH, LOUISIANA NO. 7

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GRANT PARISH, LOUISIANA NO. 9

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SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second letter is a capital if the mapping unit is broadly defined 1/; otherwise, it is a small letter. Map units without slope designation have the percent slope given in the map unit description.

1/ The composition of these units is more variable than that of others in the survey area but has been controlled well enough to be interpreted for the expected use of the soils.

SYMBOL	NAME
Ad	Armistead clay
Br	Briley loamy fine sand, 5 to 12 percent slopes
Ca	Caddo silt loam
Cd	Cadeville very fine sandy loam, 2 to 5 percent slopes
Ce	Cadeville very fine sandy loam, 5 to 12 percent slopes
Ch	Cahaba fine sandy loam, 1 to 3 percent slopes
Ga	Gallion silt loam
Gb	Gallion silty clay loam
Gc	Gallion silt loam, occasionally flooded
Gn	Glenmora silt loam, 1 to 3 percent slopes
Go	Gore silt loam, 1 to 5 percent slopes
Gr	Gore silt loam, 5 to 12 percent slopes
Gu	Guyton silt loam
GY	Guyton and Cascilla soils, frequently flooded
Ko	Kolin silt loam, 1 to 3 percent slopes
La	Latanier clay
Ma	Malbis fine sandy loam, 1 to 5 percent slopes
Me	Mayhew silty clay loam
Mf	Metcalf very fine sandy loam
Mn	Moreland silt loam, overwash
Mo	Moreland silty clay loam
Mr	Moreland clay
Mt	Moreland clay, gently undulating
Mw	Moreland clay, occasionally flooded
Nd	Norwood silt loam
No	Norwood silty clay loam
Nr	Norwood silt loam, gently undulating
Pt	Pits, gravel
RK	Rigolette-Kisatchie association, hilly
Rm	Roxana very fine sandy loam
Rn	Roxana very fine sandy loam, occasionally flooded
Ro	Roxana very fine sandy loam, frequently flooded
Rp	Ruston fine sandy loam, 1 to 5 percent slopes
RR	Ruston-Cadeville association, moderately rolling
RS	Ruston-Smithdale association, moderately rolling
Sm	Smithdale fine sandy loam, 5 to 12 percent slopes
St	Sumter Variant silty clay loam, 1 to 5 percent slopes
Un	Una silty clay, frequently flooded
Uo	Urbo Variant silty clay loam, occasionally flooded
Va	Vaiden silty clay, 1 to 5 percent slopes
Yo	Yorktown silty clay

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) — Hedley Airstrip

- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water, w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — Go, Ma

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot